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THE KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY.

EDITED BY

THEO. S. CASE.

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KANSAS CITY

REVIEW OF SCIENCE AND INDUSTRY,

A MONTHLY RECORD OF PROGRESS IN

SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. VI. DECEMBER, 1882. NO. 8.

ANTHROPOLOGY.

THE ANCIENT MAN OF CALAVERAS.

W. O. AYRES.

In the minds of almost all, the existence of prehistoric man in California is associated mainly with the famous "Calaveras skull," and inasmuch as doubt has been cast on the authenticity of that relic, the whole subject has been badly neglected, and even by men of science has been unreasonably set aside. We will speak of that skull presently, but it is only one of the many evidences to be considered, and we will at first put it out of view. We shall find that if it had never come to light at all, the proofs that man existed when, or rather before, the auriferous gravel was deposited, are so complete that he who doubts them would as readily doubt that Napoleon Bonaparte died on the Island of St. Helena.

The auriferous gravel of the books is the pay-dirt of the miners, and that we may know what the existence of man at the time of its deposit means, we must endeavor to ascertain how long ago that deposit occurred. If we say to a geologist that the gravel is of Pliocene age, he carries back his thoughts over an interval of which the years reckoned by thousands are never counted, though he knows the thousands must be very many. But for those to whom Pliocene and Post-Pliocene sound like barbarous terms it may be possible to adduce a form of proof which appeals to the eye, and which brings with it therefore, a force which all can appreciate.

It is well to state at the outset that the pay-dirt is manifestly all of one formation and of one geological age, wherever we find it. Some of it is lying opened and exposed; we will let that pass. Some of it is covered by volcanic rock, and of course is itself older than the rock; that is, the lava flowed out and covered the gravel after the gravel was in its present form and position. That is sure, for after the gravel was thus imbedded, it has most certainly never been disturbed until within these last few years the miners have dug into it in search of gold. To the gravel then below the lava, we will turn our attention.

Looking out from Carson Hill, in Calaveras County, you see across the Stanislas in Tuolumne, a long mountain ridge. It extends down into the plain, where it ends very abruptly, while its upper limit is out of sight away among the main heights of the Sierra Nevada. It looks like a huge railroad embankment, and suggests to you that idea, but men do not make railroad dykes forty miles long and 1500 to 3000 feet high. That which gives it its smooth even upper surface is basalt, that is, ancient lava; the lower part is of looser materials. The thickness of the basalt varies at different points, being here and there hundreds of feet thicker than it is at other places a mile or two either above or below. This is Table Mountain, a name which has been famous in the history of California, as we shall see.

The question occurs to us: How came Table Mountain to exist? That basalt, when it was erupted, was fluid like other lava. How could it be piled up so thick and so abrupt (for its sides are often perpendicular) on that high mountain ridge, and remain there? Why did it not spread itself out laterally and cover the plain? But one answer to these questions can be given: *There was no plain.*

When that eruption took place and the crater or fissure opened, far up near the summit of the Sierra Nevada, it naturally flowed into the bed of the first stream which crossed its track. This it filled and followed down until, when the eruption ended, the old river bed, away down to the plain, was blocked up by the solid volcanic rock, and the waters which should have been there, were finding their way by some other track.

As time passed on, the side of the mountain range was yielding to atmospheric influences. The flowing water was carrying off the softer material on each side of the hard basalt, which had filled and obliterated the old river-bed; the Tuolumne River on the south and the Stanislas on the north, with their tributaries, were formed, and scooped out their present valleys, and thus Table Mountain, which had been deposited in the bed of an old mountain torrent, with high ridges confining it, became itself a ridge, standing like a wall above all which adjoined it. But beneath the basalt lay the stones and gravel and sand and clay which made the bed of the ancient torrent, as they do of the modern streams. And like the modern streams, their predecessor in age, but not in locality, was rich in gold, and thanks to this gold, we know something of the Ancient Man of Calaveras and Tuolumne. We know him because he has left his mark among the stones and gravel.

In what are called the "early days" in '49 and '50, the southern mines were especially noted and productive. Don Pedro's bar and Hawkin's bar on the Tuolumne were crowded with miners, and all the region about Sonora, and Columbia, and Shaw's flat, was swarming like a hive. The gold which was obtained had been brought down in company with the gravel from the mountain heights far above, by the rush of water, ages before. Wherever an old channel could be found in which the flow of water had been confined to narrow limits and to whirling eddies, there the gold had been deposited more abundantly, and rich strikes were made. While exploring these surface deposits, an old river-bed was struck at Shaw's flat, in 1854, which showed features quite distinct from the "diggings" adjacent, and in following out this discovery it became manifest that Table Mountain, as already stated, was simply a mass of lava filling an ancient torrent cañon, and that the gravel thus buried was in various places most wonderfully rich. This was the beginning of Table Mountain mining.

The whole matter had very much the character of a lottery, for the expense of running a tunnel under the mountain was very great, and the result entirely uncertain, commonly rich to even a fabulous degree, or on the contrary a total failure. The failures were many and the losses destructive to the fortunes of the men interested, but the wild excitement of golden possibilities lured multitudes along, and for years and years in succession Table Mountain was bored and tunneled most completely. It is not for us now to speak of the triumph or the heart-ache which went with the work; we know well that

> "No minstrel ever sung or told
> A song so sweet as chink of gold,"

and nowhere, even in that land of enchantment, was the wild and fatal fascination of the search more fully felt than at Table Mountain. But that goes by us. Out of these tunnels came the tokens of the past, and we see shadowy visions of the ancient man looming up.

But we will first try to measure off the intervals since the Table Mountain lava flowed; not that we can specify it in figures, but we may learn enough to reverence its extent. We will consider but one feature. This is the magnitude of the work which has been done by streams of water since the period of volcanic eruption of which mention has been made.

The western slope of the Sierra Nevada is furrowed with enormous gorges reaching from the summit ridges to the plains of the Sacremento and the San Joaquim. Any one of them may be taken as a type of all the others. At their upper part they are, of course, shallow and narrow; a few hundred feet deep and a quarter to half of a mile wide, more or less, but steadily increasing in both dimensions. Before they reach their debouchure they are ten to twenty miles wide and two to four thousand feet deep. Stand far up among the higher ranges and following with the eye the stupendous furrow through its windings, fifteen, thirty, forty miles, till all is lost in the blueness of depth and of distance, one often tries to roll back the tide of time and get some glimpse of the days when that plowshare

began its work. But the blueness of the chasm is only a faint index of the dimness which comes across the mental vision. It is idle to suggest to one thus standing and looking down the cañon of the Yuba, or the American, or the Tuolumne, that water can have done that work (and water certainly has done it) within an interval which, reckoning years by thousands, must not have written against it *very, very many*. We will not specify how many, but the number surely is great.

And all this scooping out of cañons, this furrowing the western Sierra slope into its configuration of the present era, has been done since the Table Mountain lava flowed. Of that there can be no question. The evidence is too plain to admit a doubt.

If now we find the remains of man, or works which none but man could have made, among the gravel-beds beneath Table Mountain, or in any other place amid the undisturbed pay-dirt, we cannot fail to know that human hands and human brains had done their work before the immense cañons of the Sierra Nevada commenced their formation in the little furrows near the summit down which the waters trickled.

We can take the proof only in brief, and we will take none but those which are absolutely established and authentic.

Dr. Perez Snell, of Sonora, had in his collection (this collection has unfortunately perished by fire) a human jaw which was brought out in a carload of "pay-dirt" from a shaft stretching far in beneath the Table Mountain, and with it were several stone implements. Dr. Snell did not himself see this bone in the car as it was drawn to the surface, and in the minds of some a doubt might thus be thrown on its authenticity. The specimen was given to him by a miner. If it were an isolated instance this would be possibly worth considering, but is only one of many, and at the same time it is only fair to state that there could not well have been found a miner in all that region who would have thought it worth his while to attempt a deception, nor even one who had any doubt in his own mind as to the point we are considering. They saw the products of man's work come out with the gravel too often to pay commonly any attention to them. The only wonder is that he even took the trouble to pick out the bone at all. There can be no question that for one such that has been preserved, dozens and perhaps hundreds have gone down in the current of water in the sluice washing.

In 1857 Col. Hubbs, who was afterward State Superintendent of Instruction, found in a load of "dirt" as it came out from his claim under Table Mountain, portions of a human skull. He was on the ground himself, and saw the fragments as they were taken out of the sluice. They had come from a distance of 180 feet beneath the lava. One of the pieces is now in the collection of the Boston Society of Natural History; the other in that of the Philadelphia Academy.

Mr. O. W. Stevens certifies that in 1853 he found in a shaft under Table Mountain, "about two hundred feet in," a relic that resembled a large stone bead, of white marble, about an inch and a half long and an inch and a fourth in diameter, with a hole through it a fourth of an inch across.

Dr. Snell had in his collection a stone muller or pestle which he took with his own hands from a car load of "dirt" as it came out from under Table Mountain.

Mr. Llewellyn Price certifies that in 1862 he dug a stone mortar under Table Mountain at a depth of about 200 feet from the surface and about 1800 feet in from the mouth of the tunnel.

But why need we specify any further single instances. The witnesses already given were all credible and worthy men, they could have had no possible collusion, they had no motive for deception, and the circumstances were such that they could not well be deceived as to what they stated. If any candid person will not be convinced by the evidence they give, he would be equally incredulous were a hundred more to testify to the same truths.

And the hundred more could be summoned were it worth the while, for the instances in which the products of human workmanship have been washed out of the "gravel" in searching for gold are altogether too numerous for record. Very many of them are now in the Museum of the University of California, and very many more were disregarded and lost, for so common did they become during the days of surface mining, that at length the miners paid no attention to them, and they simply went in with the refuse of the workings.

They were almost universally implements of stone, such as mortars, pestles, rude vases or platters, that is, articles which could be used for grinding food, etc., but all rough in workmanship and evidently fabricated by people low in the scale of civilization. But such as they are, they show with what appears to be conclusive proof, that they were made before Table Mountain lava was erupted, and perhaps long before, for they were also surely made before the auriferous gravels were deposited.

One item comes naturally to our consideration here in the line of confirmation The auriferous gravels contain abundant remains of plants and animals. Mastodons and elephants appear to have specially abounded; in no other part of the world have their bones and teeth been found in greater numbers. With them were found species of rhinoceros, Elotherium, horse, ox, camel, etc., etc.[1] But all of these were of types long since passed away, and the same can be said of the leaves and fossilized wood. Dr. Newberry's report characterizes them as being entirely unlike anything now growing in California, and as belonging to the Tertiary age, the later Pliocene. Now we know that the fauna and flora of a country cannot be *completely* changed except through the intervention of a very great space in time, or the agency of a sudden cataclysm and reconstruction.

And shall we now compare them in age with the others which are absolutely prehistoric, and which have disturbed the scientific world by their venerable antiquity. Fierce have been the conflicts waged over the Neanderthal skull, the Engis skull, the men of Cro Magnon and the various other relics gathered from

1 We pointed out in the *Naturalist* for January, 1880, that the occurrence of rhinoceros and Elotherium in these beds is impossible, unless transported from a long distance. The Elotherium, especially, could only have been bought there by man from Central Oregon or farther off. For camel should be read lama.—*Note by Ed. Naturalist.*

the gravels and bone-breccias of Europe. But their record is dwarfed to comparative insignificance when laid by the side of that to which we have been looking. The days of Table Mountain had passed off into the dark realm of the forgotten past ages before the drift of the valley of the Somme was deposited or the man of the Neanderthal lived. Those European relics have by none been counted older than the Post-pliocene; these of the Sierra Nevada go back to the Pliocene, and as the "new world" of modern style was the very oldest in showing itself above the waste of waters, so perhaps it was also the first to feel the step of man. It is possible that the discoveries of Ribiero in Portugal and of the English Geological Survey in India may be found to carry us as far back as the times we have been discussing, but they have thus far been strangely ignored.

What manner of man then was this Ancient Man of Calaveras? Let him speak for himself. All notice of the skull described by Professor Whitney has been purposely omitted till this moment, because it is by far the most important "find" yet made, and it is worthy of being considered by itself and in the present connection. The chief point in estimating its value, is its genuineness. It has been the subject of much criticism, and in the minds of very many, its mention barely recalls Bret Harte's ridiculous doggerel,

> "My name it was Brown, and my crust it was busted
> Falling down a shaft in Calaveras County,"

and the request to send the pieces back to old Mazzoura, has relegated the whole matter to the domain of joke. In the belief that Professor Whitney was the victim of a *sell*, the question is often asked whether there is any evidence that the skull was actually taken from the shaft to which its discovery is credited.

Now with all due submission to previous judgment (or misjudgment), I maintain that that question is of only secondary importance. The skull speaks for itself, and notwithstanding that its lower jaw is gone, it talks good English, whatever its vernacular may have been in the days of the flesh.

That it came to Professor Whitney from the hands of Mr. Mattison (or as I always heard him called, Matthewson), of Angels Camp, is certain. Where did Mr. Matthewson get that skull? I do not know, nor is the precise spot of much consequence. He says he took it from his shaft near what was then called the Forks of the Road, above Angels. Suppose he did, or suppose he foolishly tried to humbug the geologist, what does it matter? He got the skull *somewhere*, and wherever it might have been first found, it surely has imbedded in the auriferous gravel, and it had become so imbedded at the time the gravel was originally deposited.

You say, that is a bold assertion; how do you know it? I will tell you; I know it, because *the skull told me so.* I saw it and examined it carefully at the time when it first reached Professor Whitney's hands. It was not only incrusted with sand and gravel, but its cavities were crowded with the same material; and that material was of a peculiar sort, a sort which I had had occasion to know thoroughly. It was the common "cement" or "dirt" of the miners; that known

in books as the auriferous gravel. This is an article "*sui generis*"; it is not easily imitated. No skill possessed by Mr. Matthewson or any one else could have been sufficient to give the skull the characters which it had as I saw it. It is most certainly no fabrication.

But it has been said that it is a modern skull which had become incrusted after a few years of interment. This assertion, however, is never made by any one knowing the region. The gravel has not the slightest tendency toward an action of that sort. The skull would either decay and waste away, or it would remain unchanged; and added to this comes in the fact that the hollows of the skull were crowded with the solidified and cemented sand, in such a way as they could have been only by its being driven into them in a semi-fluid mass, a condition which the gravels have never had since they were first laid down.

No, no! Let the skull tell its own story, and believe what it says, because it brings its own proof. Whatever age belongs to the gravel deposit under Table Mountain belongs to the Calaveras skull, entirely irrespective of the question of honesty or dishonesty in the alleged finder. Wherever he found it, I believe its age to be beyond cavil.

Its degree of fossilization has not been here insisted upon, because that change is more rapid in some localities than in others, but it is an interesting fact that this Calaveras skull is more thoroughly fossilized, a greater proportion of its phosphate of lime has become carbonate, than in either of the European specimens which were reckoned of the greatest age.

We seem then fairly entitled to consider the Ancient Man of Calaveras the oldest representative of our race to which we can as yet refer; and being such, is he of a bestial type? Look for yourself. Figures have been published by Professor Whitney in his work. What is there bestial as shown by them? A single skull cannot, of course, speak for a whole race, but so far as this specimen can testify, what man is now, man was then. It manifests no sign of inferiority to the American race as now existing. Barbarous in habit he doubtless may have been. All the relics of workmanship thus far discovered of those coeval with him, indicate a low grade of civilization, and yet one not necessarily much, if at all, lower than that of most of the Indian tribes which formerly occupied the entire breadth of the continent. And in intellectual power, judging from his cerebral development, he might assuredly have claimed a fair average rank.—*American Naturalist.*

SOME RARE PRE-HISTORIC RELICS.

PROF. H. A. REID, DES MOINES, IOWA.

In the REVIEW of February, 1882, I gave a pretty full account of a tiny copper ax which I had found on the site of an ancient or pre-historic village at Lexington, Missouri. Since that time Mr. Charles Teubner has sent me exact natural size drawings of another such ax, found at the same place, which corresponds

so exactly with my specimen that I cannot doubt they were swedged in the same mould. And hereby another mystery is explained. My specimen has a nicely shaped edge, with the corners very neatly and artistically formed; then the body of the ax appears to have been broken off by an irregular fracture just a little below where the crease or groove should have been—but it was noticeable that there was not the slightest show of the copper having been bent by the force supposed to have broken it off. I at first explained this singular fact by supposing that the copper had been tempered and made brittle in some way, so that it would break off short and sharp without bending. But Messrs. Carey and Bailey, of our Academy of Science, "knocked the stuffing out" of this theory by proving by chemical tests that the material was pure, malleable, unalloyed, soft native copper. The apparent break had occurred just where there was the greatest bulk or thickness of the metal, and hence the perfect non-bentness of the whole piece was a phenomenal puzzle unsolved. But when Mr. Teubner's specimen was found, and showed a similar appearance of break in about the same place, (although the seeming line of fracture was not exactly the same,) it went to prove that neither of them had ever been broken at all; that each specimen as it is comprises all the metal there was in the original piece of native ore, and the apparent "broken off place" was the irregular and unshaped terminal end of the whole piece, the swedge having shaped three edges and left the fourth one just as it happened to come out.

In addition to this second copper ax relic, Mr. Teubner also has a copper relic found at the same place, which was a bit of copper about as large around as an ordinary lead-pencil, two and a half inches long, and tapering or pointed at both ends. After considerable scratching and picking and examination with magnifying glasses, it was discovered and demonstrated that this instrument was composed of four small strips of copper cold-welded or swedged together so neatly and perfectly that the relic had been much handled and several times critically examined, before this fact of its quadruplex composition was discovered; but after discovery the four pieces were picked apart at one end and some of the weld-lines traced. Well, what was it for? It may have been polished, and twisted into the hair as an ornament; but quite as likely it had no other use than as a charm, or fetish, to protect the owner from unseen harms. The small strips were probably made by rubbing or rolling a bit of the native and malleable copper ore between two heavy, flat stones until it was rolled into a sort of wire, and then the four pieces perhaps swedged together in a double mould made in hard stone, and afterward rolled between heavy flat stones.

In addition to the above, the following extract from the report of a recent meeting of the DesMoines Academy of Sciences will be of special interest to those whose taste in scientific matters runs to archæology:

"An ancient stone ax was exhibited which was different from anything of the sort ever seen or heard of before by any of the members. It was nine inches long, and two and five-eighths inches wide. The head is wrought into a peak, flat-on two sides and rounded on two sides. There is a large groove worked around

for a handle, and bosses or protuberances are worked above and below the groove, two forward, two back, and two on each broadside of the implement. The material seems to be an impure grey-stone, rough-finished, and with a good edge that has been worn smooth by use. This unique specimen belongs to Dr. A. L. Worden, of DesMoines, and was plowed up on his father's farm in Michigan, two or three years ago. Other stone axes brought in for comparison were —one by Judge Fulton from Taylor County, Iowa; one by Master Chas. Keyes, from Ohio; one by Dr. H. A. Reid, from Missouri, and one by Dr. A. G. Field, from North Des Moines. All of these except one showed that the edge was made oblique to the shaft or head of the ax—a fact of strange and curious interest."

The question arises—did the makers of these particular oblique or warp-shaped axes have an obliquity of vision or of mental action, so that they could not do true, straight work. I had noticed that same peculiarity in several axes of stone and hematite in Missouri. And it would be worth while for some one who has access to a large collection of these prehistoric axes to examine and see what proportion of them have the edge oblique or warp-wise to the body and head; and if one-half or more have that peculiarity, it would seem to give a clue for some psychological inquiries.

HUMAN REMAINS IN THE LOESS OF THE MISSOURI RIVER.

E. P. WEST.

PEABODY MUSEUM OF AMERICAN ARCHÆOLOGY AND ETHNOLOGY.

HARVARD UNIVERSITY, CAMBRIDGE, MASS., October 3, 1882.

THEO. S. CASE, ESQ., Kansas City, Mo.:

Dear Sir,—I enclose a newspaper slip at Mr. Putnam's request, and he wishes me to ask you if there is any foundation for the article. He says if it is a correct statement that some geologist ought to give the place a thorough examination. Will you kindly inform him if you have heard anything in regard to it.

Respectfully yours, J. SMITH, Ass't.

KANSAS CITY, MO., October 15, 1882.

Respectfully referred to Judge E. P. West for his consideration and action. Any communication he may choose to make upon the subject I shall be glad to receive and forward.

THEO. S. CASE, Ed. REVIEW.

KANSAS CITY, MO., Nov. 16, 1882.

COL. THEO. S. CASE, Ed. Kansas City REVIEW:

Dear Sir,—It is with great pleasure I answer the inquiry of Prof. Putnam addresssd to you through his assistant, Mr. J. Smith, and which you have done me the honor to refer to me for a reply.

The statement of finding the human remains mentioned in the newspaper slip referred to is correct. The facts may be briefly stated: Mr. Underwood is a large manufacturer of bricks in this city and has an extensive yard near its eastern limit. In the latter part of June last some of the men employed by Mr. Underwood, digging clay for the work, found a human skeleton extended in it in a horizontal position eighteen feet beneath the surface. The bones were kindly given by Mr. Underwood to the Kansas City Institute, and they are now in its collection. I saw the cast of the skeleton and a part of the bones in position in the clay, and can vouch for the depth at which they were found.

The important question is: Were they resting in the undisturbed natural formation? I think there can be but one answer to this, and that is that they were. In this opinion Mr. Underwood and other gentlemen who examined the place concur. The bones were found on a loess hill slope and within 250 feet of the summit. An obstruction to cause a fill of eighteen feet where they were found would seem almost an impossibility. Besides, the clay around and immediately above them did not differ in any way from the clay in the very extensive excavations made by Mr. Underwood for hundreds of feet around in the same hill-side and which unquestionably remained as deposited before the excavations were made. It can hardly be supposed that any people in past or present time would inter their dead so deep. All the facts seem to point to the conclusion that the individual whose remains were so mysteriously enwrapped in their mantle of clay, was engulfed in the old lake of the Champlain epoch in which the loess formation took place prior to its completion and was slowly covered in by the continued super-accumulation of that deposit. At the end of the deposit and before the work of attrition began the bones were covered probably to a depth of more than fifty feet. If it be objected that human bones would not not endure so long, it may be answered that several varieties of *Helix*, in a perfect state of preservation, and the teeth and bones of extinct mammals are found under like conditions in the same formation at depths varying from five to more than a hundred feet and which, evidently, were buried in by its precipitation.

During my geological and archæological explorations along the Missouri River in July and August last, I gathered other facts sustaining the opinion I have here expressed. At White Cloud, Kansas, I was informed by gentlemen of intelligence and unquestioned veracity, that a vase of antique pottery was found in a mound standing on the summit of the bluff immediately overlooking that city, and that another vase precisely similar, was found in a loess hill about a half mile distant from the mound, at a depth of fifteen feet below the

natural surface. This, too, was found in a brick yard, and in digging clay for brick-making. I saw and conversed with the gentleman who found and removed the vessel from the clay, and was shown the position where it was found, and I entirely concur in the opinion of the gentlemen of that place, who are conversant with the facts, that the vase must have been covered in by the lake deposits of the Champlain epoch.

Dr. Parr, of Weston, Missouri, opened a mound on the summit of the bluffs near that place, in which he found an antique vase of the basket type of pottery and containing within it fish-bones and shell beads. The Doctor was so good as to present to the Institute some of the beads and fish vertebræ, which are now in its collection in this city.

The chief importance to be attached to Dr. Parr's find is in the contents of the vase. It has been the custom of barbarous and semi-barbarous people to make provision for the subsistence of their departed friends on their supposed long journey to the spirit land. The food provided is that which the people habitually use, and such a people invariably use the food which is most accessible to them. Hence, our modern tribes, who inhabited fertile districts, such as Missouri and Kansas, subsisted almost entirely upon terrestrial animals, because such food was more accessible to them than any other; and they would never have thought of sustaining a departed friend on fish to the land of spirits. But at the close of the Loess deposit, prior thereto, and for a considerable time after its completion, conditions were different and fish must have been more abundant and more accessible than terrestrial animals, hence the subsistence provided for the tenant of the Weston mound for his sustenance to the mystic land. If it is true that these bones were deposited pending the Loess formation, and it seems difficult to escape this conclusion, a hundred centuries would be a low estimate for their profound and mysterious slumber.

The Loess deposit of Missouri and Kansas rests immediately on the glacial drift, nothing whatever intervening between them, so the Loess must have followed the drift in immediate succession.

The same glacial forces which caused the filling up of the old channel of the Niagara River, producing obstructions which diverted its course and forced it to cut a new one, and in this work to carve out that world's wonder the "Niagara Falls," operated here to produce, and leave as a monument of its power, our drift, and to fill the channel of the Missouri River some hundreds of feet, and, perhaps, actually to divert, or partially divert, it in some places.

Since its diversion, the Niagara River has cut its new channel back for a disance of seven miles. This work has required more than 36,000 years, according to the estimates of Professor Hall and the late Professor Lyell, which Professor Dana thinks very low.

As the Loess deposit rests upon and immediately succeeds the glacial drift here, 26,000 years would be a very large estimate of the time intervening between the close of the glacial epoch and the filling of the old Champlain lake to the level of where the human remains were found in the Underwood brick-

yard. Besides, the finding of the bones of the large extinct mammals in positions as high as where the human remains were found would indicate an antiquity which a hundred centuries would hardly cover.

In my limited archæological researches, in Missouri and Kansas, I have observed and gathered from others hundreds of facts bearing on this subject and all pointing to the occupancy of the bluffs bordering the Missouri River valley prior to the close of the Champlain era. But it must not be inferred that this was man's first appearance on this vast domain, for it is probable that he and the large extinct mammals existed prior to and retired before the advancing glaciers of the glacial epoch, to beyond the 40° N. latitude, and, that during the Champlain period the large animals became extinct, but that man survived, and advanced northward again upon the retiring glaciers.

I would like to pursue this subject more in detail, but cannot do so without trespassing too far on the patience of Professor Putnam. As I have remained, for some time past, under a kind of promise to the public to renew the consideration of this subject, if you will allow me space in the REVIEW, and will be so kind as to send a number to Professor Putnam, it seems to me proper to answer his inquiry through that channel, more especially so as it would add to the public interest to know that so distinguished an antiquarian and profound a thinker as Professor Putnam deems the matter of scientific importance.

With the best wishes for the success of the REVIEW and your noble effort to add to the sum of human knowledge, I remain

Yours most truly, E. P. WEST.

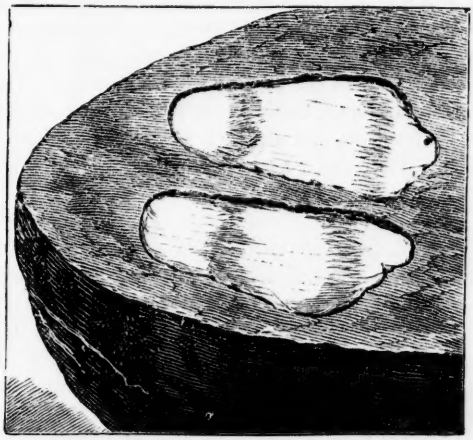
HUMAN FOOT-PRINTS IN SOLID ROCK.

THEO. S. CASE.

The discovery of supposed human foot-prints in solid rock near Carson, Nevada, leads me to call attention to those discovered by myself in October, 1880, in the Valley of the Pecos River, near the Atchison, Topeka & Santa Fe R. R., in New Mexico, and referred to in the November number of this REVIEW in an article entitled "An Excursion to the Birth-Place of Montezuma."

Our party was crossing the open prairie between Baughl's Station and the old Pecos Church, when we came to a large boulder, or fragment of sand-rock, of which there were hundreds scattered around. It being a warm afternoon and this rock lying under a clump of cedar trees, we naturally stopped to rest in the shade. While there our attention was attracted by some very singular markings upon the surface of the rock, which was about six by nine feet and about three feet high. These markings resembled human foot-prints, each being about thirteen inches long by four and one-half inches wide and about six inches apart. The cut below gives a very good idea of their appearance except that the drawing is rather too smooth and symmetrical. These tracks gave us the suggestion of their

having been made by a large man in moccasins stepping upon a soft surface and slipping forward an inch or so. The impressions are nearly or quite one inch deep.



There is another rock in the vicinity said to be similarly marked with human foot-prints, both of adults and children, also with those of a bear; these, however, are believed to have been carved with some tool. Those referred to above show no evidence of having been cut or carved, but rather, if not real impressions of human feet, appear to be the result of accidental scaling off and weathering into this peculiar shape.

ASTRONOMY.

OBSERVATIONS OF COMET B, 1882.

PROF. H S. S. SMITH.

The equipment of this Observatory does not suffice for measures of position, or for spectroscopic or photographic investigations. Attention has, therefore, been entirely directed to observation of the appearance and changes in the structure of the comet. The telescope used is a comet-seeker having an object-glass five and five-eighths inches in diameter and a focal length of forty-two inches. The tube is bent so that the eye-piece is always horizontal, the reflector being a

right angled prism. It was found that the power of fourteen was best suited to show the faint portions, as the prism absorbed so much light that the seeing with higher powers was not satisfactory. No attempt was made to study the nucleus or coma critically, as it was evident that the telescopic power was far from sufficient for the purpose. Chief attention was given to the appearance of the fainter portions, and the results seem to repay the labor expended.

The comet was first seen on the morning of September 26th, when it was low down in the horizon but quite brilliant. The nucleus was estimated to be of the same brightness as Procyon, and was seen until fifteen minutes before sunrise. The tail was about five and a half degrees long, and ceased to be visible twenty minutes before sunrise.

On October 9th the comet presented a truly beautiful appearance. As seen with the low power the nucleus appeared slightly granular and elongated in the direction of the tail. There was no dark streak in the tail near the nucleus. It was on this morning that I first saw a peculiar appearance extending from the nucleus toward the Sun. It consisted of two streaks of faint light, one on the north and one on the south side of the coma. The one on the north side was between twenty and twenty-five minutes from the nucleus, ran parallel, or nearly so, to the centre line of the tail, was quite distinctly bounded on the side away from the nucleus, but faded gradually away toward the comet proper. This streak extended fully half a degree from the nucleus toward the Sun, and was no brighter than the fainter portions of the tail that could be seen through the telescope. The streak on the south side was quite similar in general appearance, but it was only about fifteen minutes from the nucleus and extended only fifteen minutes toward the Sun. Both of these streaks extended westward from the Sun until they met the tail where it was broad enough to equal the distance between them. The first appearance of dawn was quite sufficient to render these streaks invisible.

On October 13th, this forward haze was somewhat longer, and of about the same breadth. The streaks were united by a faint haze that extended across in front of the nucleus and coma. The brighter portion of the tail seemed to be enveloped in a thin haze, and the forward haze was but a continuation of this. From this time the haze grew larger and brighter until, on October 15th, it was fully three degrees long, slightly parabolic in its outlines, (but the end was ill-defined), and of nearly uniform brightness throughout. It was bright enough to be seen with the naked eye on October 14th but it was an unusually clear morning. After the 15th the haze began to grow smaller and less brilliant, the decrease in size being very gradual at first. The lessening was first seen in the central parts of the haze becoming much fainter than the edges; then the end of the haze began to disappear, until, on October 25th, the haze was somewhat similar to its appearance when first seen on the 9th, but the boundaries were not so distinct.

What these appearances mean I do not know. The only case that is at all similar that I have met with is that of a comet of 1824 which had a tail seven de-

grees, long extending toward the Sun, and a fainter tail three and a half degrees in length turned away from the Sun.

UNIVERSITY OF KANSAS, Nov. 6, 1882.

ON SOME VOLCANIC FORMATIONS IN THE MOON[1].

HERMAN J. KLEIN.

The numerous circular formations of the Moon enclosing a hollow, in the middle of which a group of hills generally rises, are, as is known, designated Craters or Ring-mountains. By this, however, it is by no means intended that these formations are to be viewed as analogues of our terrestrial volcanoes; on the contrary, there are not only distinctions in magnitude, but fundamental differences in the entire structural type, which forbid comparison with the volcanoes of our world. The true volcanic formations of the Moon, those forms which possess the greatest similarity to our terrestrial volcanoes, were not, generally speaking, known at all to the earlier selenographers, Schröter, Lohrmann, and Mädler.

Neison, in his new work 'The Moon,' remarks that the real representatives on the Moon of our terrestrial volcanoes are what he terms "crater-cones." They are those steep or conical hills which vary in size from one-half to two or three English miles in diameter, with a precipitous funnel-shaped central hollow scarcely half the breadth of the hills themselves. When the Sun stands at a great height above them, they are visible through powerful telescopes as very minute white spots; and under a moderate elevation of the Sun, the central chasm that forms the crater can sometimes be perceived in their middle. But for this, a calm clear atmosphere is necessary and a very powerful telescope. Sometimes they appear on the summit of a mountain, not rarely also on the plain enclosed by a ring-mountain or on a walled plain, as in Plato and Fracastorius. To this kind of forms belongs also the small hill containing a crater which at present rises within the at one time large crater Linne, and which can only be seen for a short on the terminator. In the time of Lohrmann and Mädler, Linne was six or seven English miles in diameter, and was at least 1000 feet deep. The filling up of this large old crater was remarked by Schmidt in October, 1866; and on the 26th day of December of that year he saw for the first time that a low "crater-cone" had risen on the new plain, having a central chasm of perhaps 300 metres in diameter. I regard this crater, which I have also seen, as a real representative on the Moon of our terrestrial volcanoes. Similar forms can be made out in great number in the interior of the flat ring-mountain Stadius.

Mädler previously noticed here several tiny little crater-cavities; and Neison mentions thirteen crater-pits on the enclosed plain of Stadius, while Schmidt counts fifty of them. None of these observers, however, mention that these tiny

1 From Peterman's 'Mittheilungen,' 1882, Heft. vi. (Translation).

craters lie on the summits of pretty steep cones. When Stadius emerges from the lunar night, these "crater-cones" are revealed in immense numbers, like thorns stuck in the ground; but as they are all small and low, the shadows quickly disappear under the ascending Sun, and then the darkness only of the crater itself can be seen.

These formations appear to have a close relationship to our volcanoes; but I would, by the way, turn the attention of selenographers, and of geologists also, to another class of forms on the Moon's surface, which appear to me to correspond in a still greater degree to our volcanic formations, and which up to the present time are little known or not at all. The only selenographer who has paid attention to these forms is Julius Schmidt in Athens. He first saw some of these formations in January and February of 1851. "In a southwesterly direction from Theophilus," he says, in his explanatory volume to his large map of the Moon, "there lie in the Mare two small dark patches, like imperfect half-shaded craters; they remain visible as dark patches under a high altitude of the Sun. The western one is the larger." This remark dates from January, 1851: on the 25th day of February of the same year Schmidt perceived close to Copernicus, and in a southwesterly direction towards Gambart, "a bright point surrounded by a dark grey nimbus, which lies in the grey plain." In the year 1873, Schmidt returned to these formations and found that there is present in them a white cavity, which at times appears like a crater. Among the numerous lunar forms which can be descried with the strong telescopes of the present time, and which I estimate at 200,000, those described above are so rare that I could only reckon five which show the type with certainty and two in which it is also very probably present.

Without being aware of Schmidt's observations, I had come upon the above mentioned very rare formations in the course of my researches on the Moon's surface. I perceived that the two objects in the neighborhood of Theophilus are craters with clear white cavities, which, at a certain distance on the outside, were surrounded by a ring of smoky grey material. In the course of my observations it gradually became manifest that the larger of the two craters fell away externally like an unusually flat cone, so that the base of this cone, which had a very moderate vertical height, yet spread itself several miles wide. Upon the highest point of this very flat base stands the precipitous cone of eruption. Radiating from the crater numerous hills or folds run out upon the gentle declivity, and between them appear tiny little craters which parasitically cover the slopes of the base in great numbers. The dark grey material is deposited only in the neighborhood of the white-colored principal crater, round about its precipitous cone, and indeed within a narrow, pretty sharply limited, circular zone. The smaller crater to the northwest exhibits similar conditions, yet I have not been able to perceive in it the radiating hills and the little parasitic craters.

Since last autumn these two craters have not generally been so plainly visible as in former years; indeed I cannot at present perceive the crater proper, but see only a grey patch within the dark ring. In the crater mentioned by Schmidt

which lies off in the direction of Gambart, and in a larger one to the north of Copernicus, the circular zone around the central cavity is broader, clearer, and, towards the outside, paler. Half a century ago, Gruithuisen discovered and repeatedly observed a similar object southward from the crater Hyginus. In this, also, there was to be seen a tiny clear white crater in the middle of a roundish, broad, grey patch. This tiny crater is in existence at the present day, and, indeed, is placed on the flat top of a very low ruined circular wall; but, in the twenty years over which my observations have extended, I have never been able to see it as a white speck. Neither do I find in Schmidt any mention of this circumstance. Now since Gruithuisen's observations are indisputable, it must be concluded that that small crater has grown darker in the course of years. From the agreement in the cases cited, but specially also from my rigorous examination of the larger crater on the southwest of Theophilus, we must conclude that the dark material which surrounds the bright shining crater was ejected from it. We may look upon it as a species of lava, which becomes bleached in time, and then assumes that appearance which we perceive in many so-called "light-surrounded" craters. That the formation of the ring of dark material or, if you will, the eruption, together with the aforesaid crater southwest of Theophilus, belong to recent times is proved by the circumstance that this dark patch, which is so obvious, and even appears in one of Rutherfurd's lunar photographs, was seen neither by Lohrmann or Mädler in the first third of our century. The conclusion that it did not then exist receives complete confirmation from the observations of Gruithuisen. I have thoroughly examined the comprehensive journals of this accurate and sharp-eyed selenographer, and have found that, on several occasions, he specially explored the locality in which to-day that dark patch is so plainly to be seen, without, however, having perceived it, although it was exactly such patches that Gruithuisen eagerly sought after.

The intimate connection between the dark material and the bright crater in its middle, as well as the inference that this mass was cast out lava-like from the crater at a time long subsequent to its formation, I have proved from several years' study of a similar crater which has been mentioned by no previous observer. In this case, thanks to the configuration of the ground, the proof is so convincing, that it could hardly be greater had it been afforded by a terrestrial volcano directly accessible to our ascent.

The object, concerning which I have now to report, lies in the inside of the great walled plain Alphonsus. Mädler has there described, out of several others in the neighborhood of the slope of the east wall, a dark triangular spot, which at at full Moon, when only little of the walls of Alphonsus is to be seen, stands out with uncommon distinctness on account of its dark color and its regular form. According to Mädler, this spot was only to be seen when the Moon stood high over the lunal landscape referred to, and was neither sunk nor raised. The circumstance that, during my observations in the interior of this dark spot, I once spied a bright point exactly similar to the central craters in the above described

formations, induced me to devote an accurate search to the object, which gradually led to the result that this also is in reality a "crater-cone" from which the dark material has flowed out. Mädler believed from his examination of the district in question that it was neither raised nor sunken. This mistake, originating probably from the weakness of his telescope, had previously been partially recognized by Schmidt, in whose map of the place in question several hills, small craters, and fissures in the ground (rills) are marked.

According to my opinion, the conditions described in the foregoing account prove the existence of phenomena on the Moon's surface which exhibit the greatest likeness to the lava-streams of our earthly volcanoes, so that there is no longer any doubt of the occurrence of genuine volcanic phenomena on the Moon. These phenomena, as far as regards the crater, belong to an epoch when the chains of hills in the surrounding district were already formed, so that the effluent matter was obliged to follow the slopes of the ground.

If, in the instances described, all the phenomena point to lava-like currents, it may be concluded in another case, although with less certainty, that the ground has been covered with masses of stones or ashes. The district referred to lies on the Moon in 1° N. Lat. and 47° W. Long. There the grey floor of the level Mare, occupied only by very low hills, is marked over with bright streaks of light. But when the Sun is low, it is perceived that an oval patch, like dark gauze, covers the ground over a surface of several square miles, and that beneath it the brighter or darker portions of the ground gleam through. This patch gives to the observer the impression that it is transparent, or as if a thin mist covered the ground. This last impression is not to be accepted, because the patch is a thoroughly permanent appearance, a modification of the color of the lunar ground.

Such an appearance must, however, result if the ground, where it is bright grey as well as where it is marked across with white stripes, has been covered by a very thin layer of stones or ashes. Similar indications are to be found in other parts of the Moon's surface, but they have till now escaped selenographers, because these have generally had in their eyes only the more universal and larger features of the lunar surface, and the search after detail is, properly speaking, only now beginning.

This detailed survey has already proved that there is a far greater similarity between the surface of the Moon and that of our Earth than was formerly believed; but the research is only at its commencement and confronts a literally endless amount of detail: besides, it is far more difficult and entails a greater strain than many other kinds of observation.

It is greatly to be desired, on the part of geologists, that the lunar formations should be submitted to a thorough study founded on eye-scrutiny; the result would be remarkable for the better knowledge we should gain of lunar and also of terrestrial formations.—*The Observatory.*

ANATOMY AND PHYSIOLOGY.

TEETH AND BRAIN.

R. WOOD BROWN, M. D., D.D.S.

"'Tis the sublime of man,
Our noontide majesty, to know ourselves
Part and portion of a wondrous whole."

COLERIDGE.

Nature does not waste time or material. Nowhere in her wide domains can we find anything in the formation of which she has produced an insufficient quantity for a purpose, or a surplus of material to effect a certain end. Everything is so nicely adapted to the wants of the creature that not anything can be added or taken away without detriment to life. Nature has a method of doing things, of adapting certain things to produce a certain object in a certain manner, and there are no deviations. To illustrate what is meant by this so called adaptive modification, let me refer to the dentition of the poisonous and non-poisonous snakes. The python (non-poisonous) has two rows of well-developed teeth in the upper jaw, and no poisonous fang; the next, the cobra, (colubrine, poisonous) has the inner row of superior teeth small and almost useless, and an immovable fang; then comes the rattlesnake (viperine, poisonous) has only one row of teeth in the upper jaw, but has a large movable fang; the inner row of superior teeth have disappeared because not necessary, the movable fang taking its place. To illustrate further those birds that nature intended for flight have some part of their anatomy especially adapted for it. Take, for instance, the pigeon; it has some of its bones hollow, with a connection between them and its lungs in such a manner that when the bird is about to take its flight, warm air is forced from the lung into the hollow bones, thereby enabling the bird to ascend and fly more easily. This arrangement applies to all flying birds except the woodcock. Only such birds as fly have warm air injected into their bones, and then only in accordance with their needs. To take a third illustra-illustration, those animals that prowl around, seeking food at all times and in all places, have the walls of their crania very thick, while man, who is the only creature that walks erect, has a very thin skull, comparatively speaking. Here again is shown the adaptive modification. Nature at all times, in all places, and under all circumstances shows herself to be an astute artisan, never wasting her material or energy. This evening I shall prove to you that nature does not waste her forces, that she does not put a human tooth into a head with an animal brain, nor an animal tooth in a head with a human brain; that as teeth decide the order

to which an animal belongs, they do also indicate the intelligence of the possessor of them. Therefore, the point I shall make is this, that the nearer an animal's tooth approaches the typical human molar tooth, the nearer that animal's brain approaches the human brain, both as to comparative weight and size, also as to position, convolutions and depth of sulci. The brain or encephalon is divided into four parts; the cerebrum, the cerebellum, the pons varolii, and the medulla oblongata. For our purpose we shall use only the first two parts. The brain structurally is divided into white and gray matter, the white making up the greater part of the whole, the gray being upon the surface and the sulci, and upon its amount depends the power either intellectual or animal; the amount of gray being augmented by the number of convolutions and the depth of sulci. The cerebrum controls the intellectual or intelligent, and the cerebellum the animal functions of the creature. In the human brain the cerebrum in amount is to the cerebellum as nine to one. In the human brain the cerebrum completely covers the cerebellum when looking from the top of the head. The greater the size of the cerebrum and cerebellum, the greater the number of convolutions and depth of sulci, the greater is the power of intelligence and animal functions respectively. Man, from the nature of his construction, needs an intellectual brain, and that intellectual brain needs a mixed diet upon which its integrity depends, and which it cannot get with teeth like the shark, alligator, ox, or dog. Therefore, man has teeth for a mixed diet because he needs them, and where there is no such diet needed nature does not produce teeth like unto man's. Reasoning from this basis, it is fair to presume that if there is a gradation of intellectual brain-power from man down, there must also be gradations of teeth from man down. If we look at the head of a wolf-fish we find the lowest order of brain-power, and a very large number of pointed teeth, each tooth the same in shape but varying in size, the same as regards the common pike. The character of its teeth would indicate that its aim in life was to satisfy its hunger, which it does by tearing off shell-fish from adjacent rocks with its front teeth and crushing them with its back ones. The teeth are slightly anchylosed to the jaw as is the case with most fishes. In the lizard (varanus Gouldii) we find that the teeth are produced like the alligators, but different in shape, being like flattened cones. They are all similar in shape but different as regards size. The lizard has a very small brain, is very stupid, slow of motion, and like all reptiles, is cold blooded, caused by having but three cavities in the heart, one auricle and two ventricles, which causes the venous and arterial blood to mix. When we come to examine the ophidian reptiles (snakes) we find cold-blooded reptiles, with a complicated dental apparatus. The teeth are different in size, same in shape. The venomous snakes have a poisonous fang, but only one row of teeth in the upper and one row of teeth in the lower jaw. The non-venomous snakes have two rows of teeth in the upper jaw and one row in the lower, but no poisonous fang. They, like all reptiles, have a quadrate bone. The teeth are organs of prehension, as snakes invariably swallow their prey whole. When the viperine snake is about to strike the mouth is opened, a muscle contracts and moves the quadrate bone forward; this move-

ment causes the partial rotation of the inferior maxilla or lower jaw, and this rotation throws the fang into an erect position. The act of striking causes a muscle to contract over the poison sac and the fluid is forced into the wound through the grooved fang. When the fang is withdrawn the mouth shuts and the parts return to their first position, and the fang lies upon the roof of the mouth in a fold of mucous membrane. We certainly cannot award to this class (ophidian reptiles) a very high order of intelligence.

The alligator or American crocodile is a familiar reptile. It is a native of the Lower Mississippi, and its characteristics are well known. The teeth are all the same shape and the same number from birth to death, each tooth being replaced by its successor growing inside the old one and causing its absoption, and eventually taking its place without making a new socket. The teeth are all pointed, far apart, and firmly planted in the socket. The alligator's brain is non-convoluted, perfectly smooth and one ganglion behind the other. In a head three feet long the brain is the size of the thumb. Notice three points here. The small size of brain, the smoothness of lobes, and the teeth being the same shape and nearly so in size. As regards birds, there is only one authentic specimen found with teeth. That was found by the late Professor Mudge, of Kansas, in the cretaceous deposits of Colorado, Niobrara group. Its beak is about seven and one half inches long by one and a quarter broad. The teeth are arranged in a straight line, and about twenty one in each ramus of the lower jaw, and there appears to be the same number in the upper jaw. This was supposed to be an aquatic bird and used its recurved teeth for securing fish. This fossil is in the possession of Professor Marsh. This bird does not bear upon our subject only so far as birds are the connecting link between the reptilian and mammalian classes.

In the elephant we find a very small brain compared to its size, it being one of the largest existing mammals. The average weight of the brain is from eight to ten pounds. This animal gets its intelligent look from its large frontal sinuses, while in reality the animal is not as intelligent as its looks would indicate. The teeth are formed for a herbivorous diet. The molars, six in number, grow from above downward and outward in continuous plates of enamel, separated by dentine, and surrounded by cementum. The first, or baby molar, being the smallest, and the last one fifteen inches long. Only one part of the molar is used at a time. The tusks correspond to the incisor teeth. Neither is the size of the brain in proportion to the size of the body, nor its position, nor do the teeth of the elephant indicate a high order of intelligence. We will pass by the rodentia or gnawing tribe, comprising the mouse, beaver, squirrel, rabbit, etc., and come directly to the carnivora, of which the tiger is a typical member. We first notice the immense size of the canines, also the spaces between the front teeth for the reception of the lower teeth when the jaws are closed. The molars are made for crushing, yet we can see a gradual approximation to the human molar; the surface is not flat like the elephant's nor surmounted with cusps like the human's molar. The facial angle is greater in the tiger than in the preceding animal. The brain is small, sets far back in the head, and the cerebellum is partially cov-

ered by the cerebrum. We must now notice, as we ascend the scale, the relation of the cerebrum and cerebellum have to the facial angle, for where the angle is increased, we have an increase of lapping of the cerebrum over the cerebellum. This increase of lapping and an approach to right angles is accompanied by an increase of resemblance in the teeth to the human molar tooth. In the same class with the tiger, are the lion, cat, etc. We notice that the teeth of the carnivora are different in shape and size from the fish and reptile, at the same time we find that, while the brains of the two latter are smooth and free from convolutions, the brains of carnivora have some convolutions and a certain depth to the sulci. Here it is seen that the brain develops toward man, as also do the teeth. The average weight of the cat's brain is one ounce and a drachm.

The dentition of the dog is similar to that of wolves and foxes, but the dog has a larger range of diet owing to the molars being tuberculated in addition to the full armament of sharply-pointed teeth. With the tuberculated molars of the dog, we have a greater facial angle, consequently more lapping of cerebrum, more convolutions and greater depth of sulci, in all of which the dog is superior to the preceding animals. In the ox we have a strictly herbivorous animal, belonging to the class termed Ruminantia, comprising the deer, antelope, camel, sheep, giraffe, etc. In the typical Ruminantia, sheep, oxen, etc., there are no incisors in the upper jaw and no canines in either. The ox has six molars made up of circles of enamel, dentine and cementum. The molar teeth are an improvement upon the dog's, and the brain weigh sixteen ounces and fifteen drachms.

In the horse we find that there are incisors and molars in both upper and lower jaws; the horse has canines, but the mare has not. The molars are moulded upon the same plan as the ox, but the brain case is larger and weighs more in proportion, twenty-two ounces and fifteen drachms. The facial angle of the horse is greater, there are more convolutions and greater depth of sulci. The intelligence of a horse above most other animals is a well established fact.

The Chimpanzee in form and structure exhibits the greatest resemblance to man. The Chimpanzee is the highest form of brute, just as the Australian is one of the lowest forms of man. The Chimpanzees are gregarious animals; they walk erect with their hands upon their thighs, they are said to build huts and live in settlements. The face also resembles man, but the outline is rather concave. The facial angle is a low as 35° but increases when measured over the superciliary ridge. The proportion of brain to face is very nearly equal, the latter preponderating. In no animal do we find so much brain-matter, in proportion to the face, as in the Chimpanzee. The dental arrangement of this animal is different from the human species although having the same number of teeth, and the molars and bicuspids very similar in shape, yet the canines and incisors are very large, with spaces between them for the antagonizing teeth to rest between. The cerebrum in the Chimpanzee very nearly covers the cerebellum; more convolutions and a greater number of sulci are found. The walls of the brain case are thinner than the lower brutes, the rule being, the more contracted the brain, the thicker the walls of the skull.

The Chimpanzees belong to the group known as the Anthropoidal or man like apes, which includes the Gorilla, Orang and Gibbon. This group have the same number of teeth as man, the same number of incisors, canines, bicuspids and molars, thirty-two teeth in all, while their deciduous or milk-teeth are the same as in man, twenty in number. The brain of the man differs far less from the brain of this group, than does the brain of some of the lowest animals. The Gorilla is much heavier than man yet its brain weighs about twenty ounces while the smallest, healthy human brain would not be less than thirty-two ounces. The size of the Gorilla's brain is larger than the preceding animals when compared in size with the weight of the animal.

There is a vast difference between civilized man and the lowest savage; difference in cerebral area, in physiognomy, in regularity of teeth; but however vast that might be, it is immaterial as compared to the contrast in these respects presented by the lowest form of man and the highest form of brute species. The connecting link between the lowest races of man and the highest brutes is yet to be found.

In the Australian we find the lowest order of intellectual ability, especially amongst the Papuans. They reckon time by dry or rainy seasons, and number only up to ten, they have no religion, their marriage ceremony consists of each eating half a roasted banana. There is a great prominence of the superior maxillæ, with recession of the frontal eminence. The cerebral area is much less than in the European, and vastly more than in the Chimpanzee, the facial angle is between 80° and 85°, and there is some prominence of the superior canines. What has been said of the Australian is true of the African to a great extent, but the Negro is superior to the Australian, in cerebral development.

Man has the straightest form, the only being that walks erect, that has a perfect dental arch, no one tooth above its fellow, that has a gradual change from the cutting tooth (incisors) to the grinding tooth (molar), and that has the cerebrum completely covering the cerebellum, also having the largest brain known, except the whale and the elephant. Man's brain averages in weight forty-eight and one-half ounces, or a trifle more than three pounds, also a facial angle of 95°; the Greeks adopted for their beau ideal of the beautiful and intellectual, a facial angle of 100°.

The preponderance of the brain over the face is very noticeable in the European head. In the dog it was about one-third, in the Chimpanzee less than one-half, while in the European, the brain occupies by far the largest part of the head. In man's brain the convolutions are numerous and the sulci deep, in accordance with the intellectual development; again, see what a subordinate position the animal cerebellum has under the intellectual cerebrum. In animals with carnivorous and herbivorous teeth the cerebellum is the dominating power; in man, with teeth for a mixed diet, the cerebrum holds the sceptre and everything is subservient to it.

We have described the skull, brain, and teeth of the human species, also the same parts of several animals of different orders. We have pen-sketched the pro-

gressive ascent in the scale from the fish to man. We have compared the separate parts of each, showing that the skull, brain and teeth have kept pace each with the other in their respective places, no one ahead of the other, but gradually ascending in the scale. We have seen how nature improved on her previous efforts. We have shown that where an improvement was needed it was made; and we can readily see why a fish's tooth was not placed in man's head or *vice versa*. We have also demonstrated that the near approach of an animal's tooth to man's indicated a near approach of that animal's brain to man's. We have described the vast differences that exist between different animals, and comparatively with man, and this all shows that the nearer an animal's tooth approaches to man's in shape, size, and anatomical construction, the nearer that animal's brain approaches to the brain of man. In closing we cannot do better than to quote from the immortal Agassiz: He says, "It is evident that there is a manifest progress in the succession of beings on the surface of the globe. This progress consists in an increasing similarity to the living races, and among the vertebrates, especially, in their increasing similarity to man. But this connection is not the consequence of a direct lineage between the races of different ages." Again we quote, "The link by which they are connected is of a higher and immaterial nature; and their connection is to be sought in the view of the Creator himself, whose aim in forming the Earth, in allowing it to undergo the successive changes which geology has pointed out, and creating successively all the different types of animals which have passed away, was to introduce man upon the surface of the globe. Man is the end toward which all animal creation has tended, from the first appearance of the first Palæozic fishes."

ECCENTRICITY AND IDIOSYNCRASY.[1]

WILLIAM A. HAMMOND, M. D.

ECCENTRICITY.—Persons whose minds deviate in some one or more notable respects from the ordinary standard, but yet whose mental processes are not directly at variance with that standard, are said to be eccentric. Eccentricity is generally inherent in the individual, or is gradually developed in him from the operation of unrecognized causes as he advances in years. If an original condition, it may be shown from a very early period of life, his plays, even, being different from those of other children of his age. Doubtless it then depends upon some peculiarity of brain structure, which, within the limits of the normal range, produces individuality of mental action.

But eccentricity is not always an original condition, for, under certain circumstances, it may be acquired. A person, for instance, meets with some circumstance in his life which tends to weaken his confidence in human nature. He accordingly shuns mankind, by shutting himself up in his own house and refusing

1 An extract from a Treatise on Insanity shortly to be published by D. Appleton & Co.

to have any intercourse with the inhabitants of the place in which he resides. In carrying out his purpose he proceeds to the most absurd extremes. He speaks to no one he meets, returns no salutations, and his relations with the tradesmen who supply his daily wants are conducted through gratings in the door of his dwelling. He dies, and the will which he leaves behind him is found to devote his entire property for the founding of a hospital for sick and ownerless dogs, "the most faithful creatures I have ever met, and the only ones in which I have any confidence."

Such a man is not insane. There is a rational motive for his conduct—one which many of us have experienced, and which has, perhaps, prompted us to act in a similar manner, if not to the same extent.

Another is engaged in vast mercantile transactions, requiring the most thorough exercise of the best faculties of the mind. He studies the markets of the world, and buys and sells with uniform shrewdness and success. In all the relations of life he conducts himself with the utmost propriety and consideration for the rights and feelings of others. The most complete study of his character and acts fails to show the existence of the slightest defect in his mental processes. He goes to church regularly every Sunday, but has never been regarded as a particularly religious man. Nevertheless, he has one peculiarity. He is a collector of Bibles, and has several thousand of all sizes and styles, and in many languages. If he hears of a Bible, in any part of the world, different in any respect from those he owns, he at once endeavors to obtain it, no matter how difficult the undertaking, or how much it may cost. Except in the matter of Bibles he is disposed to be somewhat penurious—although his estate is large—and has been known to refuse to have a salad for his dinner on account of the high price of good olive-oil. He makes his will, and dies, and then it is found that his whole property is left in trust to be employed in the maintenance of his library of Bibles, in purchasing others which may become known to the trustees, and in printing one copy, for his library, of the book in any language in which it does not already exist. A letter which is addressed to his trustees informs them that, when he was a boy, a Bible which he had in the breast-pocket of his coat preserved his life by stopping a bullet which another boy had accidentally discharged from a pistol, and that he then he had resolved to make the honoring of the Bible the duty of his whole life.

Neither of these persons can be regarded as insane. Both were the subjects of acquired eccentricity, which, in all likelihood, would have ensued in some other form, from some other circumstance acting upon brains naturally predisposed to be thus affected. The brain is the soil upon which impressions act differently, according to its character, just as, with the sower casting his seed wheat upon different fields, some springs up into a luxuriant crop, some grows sparsely, and some, again, takes no root, but rots where it falls. Possibly, if these individuals had lived a little longer, they might have passed the border line which separates mental soundness from mental unsoundness; but certainly, up to the period of their deaths, both would have been pronounced sane by all competent laymen

and alienists with whom they might have been brought into contact; and the contest of their wills, by any heirs-at-law, would assuredly have been a fruitless undertaking.

They chose to have certain ends in view, and to provide the means for the accomplishment of those ends. There were no delusions, no emotional disturbance, no hallucinations or illusions, and the will was normally exercised to the extent necessary to secure the objects of their lives. At any time they had it in their power to alter their purposes, and in that fact we have an essential point of difference between eccentricity and insanity. We may regard their conduct as singular, because they made an unusual disposition of their property; but it was no more irrational than if the one had left his estate to the "Society for the Prevention of Cruelty to Animals," and the other had devoted his to sending missionaries to Central Africa.

Two distinct forms of eccentricity are recognizable. In the one, the individual sets himself up above the level of the rest of the world, and marking out for himself a line of conduct, adheres to it with an astonishing degree of tenacity. For him the opinions of mankind in general are of no consequence. He is a law unto himself; what he says and does is said and done, not for the purpose of attracting attention or for obtaining notoriety, but because it is pleasing to himself. He does not mean to be singular or original, but he is nevertheless, both. For every man is singular and original whose conduct, within the limits of reason and intelligence, differs from that of his fellow-men. He endeavors to carry out certain ideas which seem to him to have been overlooked by society to its great disadvantage. Society usually thinks different; but if the promulgator is endowed with sufficient force of character, it generally happens that, eventually, either wholly or in part, his views prevail. All great reformers are eccentrics of this kind. They are contending for their doctrines, not for themselves. And they are not apt to become insane, though sometimes they do.

The subjects of the other form occupy a lower level. They affect singularity for the purpose of attracting attention to themselves, and thus obtaining the notoriety which they crave with every breath they inhale. They dress differently from other people, wearing enormous shirt-collars, or peculiar hats, or oddly cut coats of unusual colors, or indulging in some other similar whimsicality of an unimportant character, in the expectation that they will thereby attract the attention or excite the comments of those they meet.

Or they build houses upon an idea perhaps correct enough in itself, as, for instance, the securing of proper ventilation; but in carrying it out they show such defective judgment that the complete integrity of the intellect may, perhaps, be a matter of question. Thus, one gentleman of my acquaintance, believing that fireplaces were the best ventilators, put four of these openings into every room of his house. This, however, was one of the smallest of his eccentricities. He wore a ventilated hat, his clothing was pierced with holes, as were even his shoes; and no one could be in his company five minutes without having his attention directed to these provisions for securing health.

In addition to these advanced notions on the subject of ventilation, he had others equally singular in regard to the arrangement of the furniture in his dwelling and the care that was to be taken of it. Thus, there was one room called the "apostles' room." It contained a table that represented Christ, and twelve chairs, which were placed around it and typified the twelve apostles; one chair, that stood for Judas Iscariot, was covered with black crape. The floor of this room was very highly polished, and no one was allowed to enter it without slipping his shod feet into cloth slippers that were placed at the door ready for use. He had a library, tolerably large but of little value, and every book in it which contained Judas's name was bound in black, and black lines were drawn around the name wherever it occurred. Such eccentricity as this is not far removed from insanity, and is liable at any time, from some cause a little out of the common way, to pass over the line.

Thus, a lady had since her childhood shown a singularity of conduct as regarded her table furniture, which she would have of no other material than copper. She carried this fancy to such an extent that even the knives and forks were of copper. People laughed at her, and tried to reason her out of her whim, but in vain. She was in her element as soon as attention was directed to her fancy and arguments against it were addressed to her. She liked nothing better than to be afforded a full opportunity to discuss with any one the manifold advantages which copper possessed as a material to be used in the manufacture of every article of table ware. In no other respect was there any evidence of mental aberration. She was intelligent, by no means excitable, and in the enjoyment of excellent health. She had, moreover, a decided talent for music, and had written several passably good stories for a young ladies' magazine. An uncle had, however, died insane.

A circumstance, trifling in itself, but one, as it afterward resulted, of great importance to her, started in her a new train of thought, and excited emotions which she could not control. She read in a morning paper that a Mr. Koppermann had arrived at one of the hotels, and she announced her determination to call upon him, in order, as she said, to ascertain the origin of his name. Her friends endeavored to dissuade her, but without avail. She went to the hotel, and was told that he had just left for Chicago. Without returning to her home, she bought a railway ticket for Chicago, and actually started on the next train for that city. The telegraph, however, overtook her, and she was brought back from Rochester raving of her love for a man she had never seen, and whose name alone had been associated in her mind with her fancy for copper table furniture. She died of acute mania within a month. In this case erotic tendencies, which had never been observed in her before, seemed to have been excited by some very indirect and complicated mental process, and these in their turn developed into general derangement of the mind.

In another case, a young man, a clerk in a city bank, had for several years exhibited peculiarities in the keeping of his books. He was exceedingly exact in his accounts, but after the bank was closed always remained several hours, dur-

ing ich he ornamented each page of his day's work with arabesques in different colored inks. He was very vain of this accomplishment, and was constantly in the habit of calling attention to the manner in which, as he supposed, he had beautified what would otherwise have been positively ugly. His fellow-clerks amused themselves at his expense, but his superior officers, knowing his value, never interfered with him in his amusement. Gradually, however, he conceived the idea that they were displeased with him, and at last the notion became so firmly rooted in his mind that he resigned his position, notwithstanding the protestations of the directors that his idea was erroneous. Delusions of various other kinds supervened, and he passed into a condition of chronic insanity, in which he still remains. In most of the cases occurring under this head the intellectual powers are not of a high order, though there may sometimes be a notable development of some talent, or even a great power for acquiring learning. Painters, sculptors, musicians, mathematicians, poets, and men of letters generally, not infrequently exhibit eccentricities of dress, conduct, manner, or ideas, which not only merely add to their notoriety, but often make them either the laughing-stocks of their fellow men or objects of fear or disgust to all who are brought into contact with them.

IDIOSYNCRASY.—By idiosyncrasy we understand a peculiarity of constitution by which an individual is affected by external agents in a manner different from mankind in general. Thus, some persons cannot eat strawberries without a kind of urticaria appearing over the body; others are similarly affected by eating the striped bass; others again, faint at the odor of certain flowers, or at the sight of blood; and some are attacked with cholera-morbus after eating shell-fish—as crabs, lobsters, clams, or mussels. Many other instances might be advanced, some of them a very curious character. These several conditions are called idiosyncrasies.

Begin,[2] who defines idiosyncrasy as the predominance of an organ, a viscus, or a system of organs, has hardly, I think fairly grasped the subject, though his definition has influenced many French writers on the question. It is something more than this—something inherent in the organization of the individual, of which we only see the manifestation when the proper cause is set in action. We cannot attempt to explain why one person should be severely mercurialized by one grain of blue mass, and another take daily ten times that quantity for a week without the least sign of the peculiar action of mercury being produced. We only know that such is the fact; and were we to search for the reason, with all the appliances which modern science could bring to our aid, we should be entirely unsuccessful. According to Begin's idea, we should expect to see some remarkable development of the absorbent system in the one case, with slight development in the other; but, even were such the case, it would not explain the phenomena, for, when ten grains of the preparation in question are taken daily, scarcely a day elapses before mercury can be detected in the secretions, and yet

2 "Physiologie Pathologique," Paris, 1828, t. i., p. 44.

hydrargyriasis is not produced; while when one grain is taken, and this condition follows, the most delicate chemical examination fails to discover mercury in any of the fluids or tissues of the body.

Begin's definition scarcely separates idiosyncrasy from temperament, whereas, according to what would appear to be sound reasoning, based upon an enlarged idea of the physiology of the subject, a very material difference exists.

Idiosyncracies are often hereditary and often acquired. Two or more may exist in one person. Thus, there may be an idiosyncrasy connected with the digestive system, another with the circulatory system, another with the nervous system, and so on.

An idiosyncrasy may be of such a character as altogether to prevent an individual following a particular occupation. Thus, a person who faints at the sight of blood cannot be a surgeon; another, who is seized with nausea and vomiting when in the presence of insane persons, cannot be a superintendent of a lunatic asylum—not, at least, if he ever expects to see his patients. Idiosyncrasies may, however, be overcome, especially those of a mental character.

Millingen[3] cites the case of a man who fell into convulsions whenever he saw a spider. A waxen one was made, which equally terrified him. When he recovered, his error was pointed out to him. The wax figure was put into his hand without causing dread, and shortly the living insect no longer disturbed him.

I knew a gentleman who could not eat soft crabs without experiencing an attack of diarrhea. As he was exceedingly fond of them, he persevered in eating them, and finally, after a long struggle, succeeded in conquering the trouble.

Individuals with idiosyncrasies soon find out their peculiarities, and are enabled to guard against any injurious result to which they would be subjected but for the teachings of experience.

Idiosyncrasies may be temporary only—that is, due to an existing condition of the organism, which, whether natural or morbid, is of a transitory character. Such, for instance, are those due to dentition, the commencement or the cessation of the menstrual function, pregnancy, etc. These are frequently of a serious character, and require careful watching, especially as they may lead to derangement of the mind. Thus, a lady, Mrs. X, was at one time under my professional care, who, at the beginning of first pregnancy, acquired an overpowering aversion to a half breed Indian woman who was employed in the house as a servant. Whenever this woman came near her she was at once seized with violent trembling, which ended in a few minutes with vomiting and great mental and physical prostration, lasting several hours. Her husband would have sent the woman away, but Mrs. X insisted on her remaining, as she was a good servant, in order that she might overcome what she regarded as an unreasonable prejudice. The effort was, however, too much for her, for upon one occasion when the woman entered Mrs. X's apartment rather unexpectedly, the latter became greatly excited, and jumping from an open window in her fright, broke her

3 "Curiosities of Medical Experience," London, 1837, vol. ii, p. 246.

arm, and otherwise injured herself so severely that she was for several weeks confined to her bed. During this period, and for some time afterward, she was almost constantly subject to hallucinations, in which the Indian woman played a prominent part. Even after her recovery the mere thought of the woman would sometimes bring on a paroxysm of trembling, and it was not till after her confinement that the antipathy disappeared.

Millingen[4] remarks that certain antipathies, which in reality are idiosyncrasies, appear to depend upon peculiarities of the senses. Rather, however, they are due to peculiarities of the ideational and emotional centres. The organ of sense, in any one case, shows no evidence of disorder; neither does the perceptive ganglion, which simply takes cognizance of the image brought to it. It is higher up that the idiosyncrasy has its seat. In this way we are to explain the following cases collected by Millingen:

"Amatus Lusitanus relates the case of a monk who fainted when he beheld a rose, and never quited his cell when that flower was blooming. Scaliger mentions one of his relatives who experienced a similar horror when seeing a lily. Zimmermann tells us of a lady who could not endure the feeling of silk and satin, and shuddered when touching the velvety skin of a peach. Boyle records the case of a man who felt a natural abhorrence to honey; without his knowledge some honey was introduced in a plaster applied to his foot, and the accidents that resulted compelled his attendants to withdraw it. A young man was known to faint whenever he heard the servant sweeping. Hippocrates mentions one Nicanor, who swooned whenever he heard a flute; even Shakespeare has alluded to the effects of the bagpipes. Julia, daughter of Frederick, King of Naples, could not taste meat without serious accidents. Boyle fainted when he heard the splashing of water; Scaliger turned pale at the sight of water-cresses; Erasmus experienced febrile symptoms when smelling fish; the Duke d'Epernon swooned on beholding a leveret, although a hare did not produce the same effect; Tycho Brahe fainted at the sight of a fox; Henry III, of France, at that of a cat; and Marshal d'Albret at a pig. The horror that whole families entertain of cheese is generally known."

He also cites the case of a clergyman who fainted whenever a certain verse in Jeremiah was read, and of another who experienced an alarming vertigo and dizziness whenever a great height or dizzy precipice was described. In such instances the power of association of ideas is probably the most influential agent in bringing about the climax. There is an obvious relation between the warnings given by the prophet in one case, and the well-known sensation produced by looking down from a great height in the other, and the effects which followed.

Our dislikes to certain individuals are often of the nature of idiosyncrasies, which we cannot explain. Martial says:

4 "Curiosities of Medical Experience," London, 1837, vol. ii, p. 246.

"Non amo te, Sabidi, nec possum dicere quare;
Hoc tantum possum dicere, non amo te;"

or, in our English version:

"I do not like you, Doctor Fell,
The reason why I can not tell;
But this I know and that full well—
I do not like you, Doctor Fell."

Some conditions often called idiosyncrasies appear to be, and doubtless are, due to disordered intellect. But they should not be confounded with those which are inherent in the individual and real in character. Thus, they are frequently merely imaginary, there being no foundation for them except in the perverted mind of the subject; at other times they are induced by a morbid attention being directed continually to some one or more organs or functions. The protean forms under which hypochondria appears, and the still more varied manifestations of hysteria, are rather due to the reaction ensuing between mental disorder on the one part and functional disorder on the other, than to that quasi normal peculiarity of organization recognized as idiosyncrasy.

Thus, upon one occasion I was consulted in the case of a lady who it was said had an idiosyncrasy that prevented her drinking water. Every time she took the smallest quantity of this liquid into her stomach it was at once rejected, with many evident signs of nausea and pain. The patient was strongly hysterical, and I soon made up my mind that either the case was one of simple hysterical vomiting, or that the alleged inability was assumed. The latter turned out to be the truth. I found that she drank in private all the water she wanted, and that what she drank publicly she threw up by tickling the fauces with her finger-nail when no one was looking.

The idiosyncrasies of individuals are not matters for ridicule, however absurd they may appear to be. On the contrary, they deserve, and should receive, the careful consideration of the physician, for much is to be learned from them, both in preventing and in treating diseases. In psychiatrical medicine they are especially to be inquired for. It is not safe to disregard them, as they may influence materially the character of mental derangement, and may be brought in as efficient agents in the treatment.—*N. Y. Medical Journal.*

MINING AND METALLURGY.

GENERAL MINING NEWS OF COLORADO.

The South Pueblo *Evening News* makes the following comparison between Pueblo and Denver as mineral shipping centers: In 1881, there was shipped from Denver gold and silver bullion, which was supplied from the various miner-

al bearing districts, as follows: Argo smelting works, $2,500,000; Gilpin and Clear Creek Counties, $2,000,000; Boulder County, $1,000,000; Park County, $1,500,000; total, $7,000,000. The above does not include lead and copper bullion. In 1881, there was shipped east from the Pueblos, via the Atchison, Topeka & Santa Fe Railroad, gold and silver bullion, supplied from the districts as follows: Lake County, $12,000,000; Gunnison, $1,000,000; San Juan, $3,000,000; total $16,000,000. This does not include the gold production of Summit County, which at the present time has reached $1,000,000 a month, or $12,000,000 a year, every ounce of which goes east via the Pueblos, and, should we add this to the figures of last year's shipment, we have a grand total of $28,000,000 of bullion (gold and silver) going east via the Pueblos yearly, while Denver can boast of but one-quarter of that amount. To these figures may be added also at least three millions, which come to the Pueblo smelters from Southern Colorado, New Mexico, and Arizona, and are there converted into bullion and shipped east.

GRANT SMELTER.—The completion of the Grant Lead Smelting Works at Denver is near at hand. The main building, 240x100 feet, is all completed. In it are eight furnaces, entirely finished, and which are calculated to average a total capacity of 300 tons a day. Adjoining the building on the west is the engine-house, 50 x 100 feet, also nearly finished, and containing a 200 horse-power engine, a large boiler, and three mammoth blowers, besides a full equipment of pumps, machinery for generating electricity for lighting the establishment, etc. The stack connecting with the dust-chambers will have a height of 165 feet. The receipt of ore has already begun, and two thousand tons will be on hand by the 1st December, when it is expected the works will begin operations.

LAKE COUNTY.

The *Democrat* gives Leadville's bullion product for the month of August as follows: Three thousand six hundred and seventy tons of lead are reported to have been produced and shipped by the Leadville smelters during the month of August. This shipment contained 522,266 ounces of silver and 1,600 ounces of gold. The total value of this shipment was within a few thousand dollars of reaching a round million. This, of course, does not include the production of the stamp mills and the ores shipped by ore-buyers and the Iron Silver and Robert E. Lee mines to Pueblo, Golden and other points.

GARDEN CITY LODE.—Among the new discoveries of ore in paying quantities, made during the past week, is that of this lode. This property is situated in California Gulch, at the foot of Iron Hill. A year or two ago, a shaft was sunk on this property, to a depth of about 150 feet, without disclosing ore in any quantity. Recently the property was leased and active operations were commenced. At a depth of seventy feet, a drift was run to the southward, and a fair body of ore was encountered. Drifts were then run in different directions, all disclosing evidently the same ore-deposit. A level now driven to the eastward shows the ore for a distance of twenty feet, having a thickness of about

thirty inches. Assays of the samples give twenty-nine ounces in silver and sixty-two per cent in lead, and nineteen ounces silver and twenty-nine per cent in lead. The former is a fine gray lead carbonate, while the latter is a hard carbonate ore.

CHRYSOLITE.—The manager, Mr. N. R. Clark, has shipped several car-loads of low-grade ore to Denver, in order to give the concentrating machines now on exhibition there a practical test on this class of mineral. The ore which it is desired to concentrate is the low-grade oxidized iron of Fryer Hill, as well as mineral carrying small percentages of lead carbonates in addition to a minimum quantity of silver. The latter mineral is about equally divided between sulphurets and chlorides of silver, making it a very difficult production to save and concentrate by any machine operated on the specific gravity principle, especially as the chlorides almost invariably exist in the low-grade ores in small, thin flakes. The manager stated that if machines were found that would do the work required, the Chrysolite Company would expend a limited amount of its surplus funds in putting in concentrating works. Suitable arrangements can be made with Messrs. Cummings & Finn for the old structure formerly inclosing the Raymond & McKay smelter, and the Chrysolite Company already possesses sufficient motive power to run such works.

MATCHLESS.—The new strike recently made was a short distance north of the No. 3 shaft, where there is quite an extensive tract of territory yet to be explored. The mineral is a silicious dark sand and iron, filled and coated with chloride and horn-silver. Up to the latest reports, the ore-body had opened up to thirty inches in thickness, and promises to show to much better advantage still, with a few days' additional work. No assays have yet been made.

ROBERT E. LEE.—Twenty tons of ore are daily shipped to the Argo smelting works, averaging about 300 ounces to the ton. There are now on the dumps of the mine from 3000 to 4000 tons of 30 to 40 ounce dry ore, which eventually will be shipped to the Leadville stamp-mills, as it is unsuited for smelting on account of the entire absence of lead and the great quantities of silica which it contains.

SHIELDS MINE AND MILL.—Work has been begun under the direction of Col. A. V. Bohn, the former superintendent. Some ore is taken from the upper workings, but in the lower levels nothing has as yet been accomplished, and the the water still covers the two drifts extending on the vein, from the incline shaft, and some distance below the main tunnel or adit. The mill has been running again for a week and has ample work before it to insure its steady employment continually. It is now reducing the ores from the Shields, Welsh, Soper, and other mines in that section, all of which are showing increased value.

PITKIN COUNTY.

The mills and mines in operation in the Gold Belt show that there is great activity in this district. Two ten-stamp mills and one twenty-stamp mill are running day and night.

The Cummings lode, says the Aspen *Sun*, has just had a mill-run, at Argo, of 48 pounds of ore, which returned 220 ounces of silver and 12 ounces of gold to the ton, netting $49.51 for the 48 pounds of ore.

A mill for the treatment of low-grade refractory silver ores is about completed at Pitkin by the Michigan & Colorado Mining Company, of that place, and will be ready to start shortly.

BRITTLE SILVER.—Active work has again begun at the mine.

STREB CONSOLIDATED.—The Carbonate *Chronicle* says that this Company has completed the assessment work on all its properties on French Mountain, and developed some of the claims quite extensively. The J. J. Streb, Colorow, and Silver Spur are all said to show strong ore-bodies ranging in value from 44 to 432 ounces of silver per ton. The vein was struck near the surface, and in doing assessment work widened from one inch to a foot. Parties are figuring for a lease of some of this Company's mines, and propose to work them with a large force through the winter.

SAN JUAN COUNTY.

The Comstock Sampling-Works have been crowded ever since they began running, and we learn enough ore has been contracted for to keep them—in connection with the North Star ore—busy running pretty nearly all winter. A building for a concentrator which will be in running order early next spring is now going up.

RED MOUNTAIN.—The excitement over the discoveries of rich mineral on Red Mountain, says the San Juan *Herald*, increases. Notwithstanding the recent unusually inclement weather, the country in that vicinity is literally covered with prospectors.—*Engineering and Mining Journal.*

THE EXTRACTION OF THE PRECIOUS METALS FROM ORES BY ELECTROLYSIS.—CONCLUDED.

ELECTROLYSIS OF COMPLEX ORES.—The same process is equally applicable to the extraction of the metals contained in the multiple sulphurets. Such sulphurets are in reality merely combinations of single sulphides combined or mixed together; consequently the decomposition of such a multiple ore in the electrolytic bath, instead of yielding merely a single metal to the acid which is set free, precipitates the precious metals which the ore contains.

Thus, if we place at the anode in an electrolytic trough an ore composed of a multiple sulphuret and make use of a solution of lead nitrate as the electrolytic liquid and let the current act moderately, it will happen that whilst the lead of the electrolytic salt is precipitated at the cathode the metals of the ore placed at the anode will enter into solution simultaneously just in proportion as the acid of the bath is set free, and will ultimately, if easily precipitable, like lead, silver, copper, etc., be thrown down together at the cathode.

Meanwhile the sulphur, the silica, and other insoluble matter in the gangue will be deposited at the anode.

Suppose that we operate upon a multiple argentiferous sulphide of lead, the ore of which contains also iron, copper, and zinc. It may happen that under the action of an electric current sufficiently energetic the iron and zinc dissolve as rapidly as the other metals, but are not as easily precipitated. In this case the electrolytic solution will become gradually saturated with zinc and iron. It is then advisable to regulate the galvanic current so that the lead, silver, gold, and copper may be precipitated alone upon the cathode, keeping the zinc dissolved in the state of zinc nitrate.

As the bath becomes saturated with zinc nitrate, the iron nitrate yields the precedence, and its base falls to the bottom of the bath in the state of ferric oxide.

Finally, when the bath is almost entirely saturated with zinc nitrate, which is kept in a state non-precipitable by regulating the current accordingly, this solution of zinc is syphoned off for separate treatment.

The opportunity is taken to remove the metals, copper, lead, silver, and gold, which have been thrown down upon the cathode in the metallic state. The ferric oxide at the bottom of the bath is withdrawn separately, and also the sulphur and the silica found at the anode.

The method of ulterior purification of the sulphur is given above.

The metallic zinc contained in the liquid syphoned off may then be precipitated by a more powerful current. If it is desired to collect the zinc in the state of oxide it must be precipitated not electrolytically but by means of chemical reactions.

This separate zinc-bath is treated first with a little zinc oxide, which throws down any iron present in the state of insoluble oxide. Then, if needful, the liquid is placed in a precipitation bath with a zinc plate for anode. A feeble electric current will throw down upon this cathode all the lead, copper, or silver which the bath may retain, leaving merely pure zinc nitrate.—*Les Mondes.*

METEOROLOGY.

HAIL AND HAILSTONES.

FRANCIS E. NIPHER.

In his work on Tornadoes and Water-spouts Mr. Ferrel, of the U. S. Coast Survey, has explained the formation of hailstones in an exceedingly satisfactory manner. According to Mr. Ferrel, the birth-place of hailstones is in the vortex of the tornado. The tornado is the result of an unstable condition of the air due

to differences of temperature. If over a region of country the air be abnormally hot, this region then being surrounded by cooler air, the hot air will begin to rise. The condition of equilibrium may be reached without the formation of a whirl, but if the heated region is large, a whirl will be very likely to form at some point, and the hot air will pour up through the vortex formed. The whirl may be the result of the meeting of currents of air, and when thus produced may rotate either with or opposed to the motion of the hands of a watch. In the former case, in the northern hemisphere, the whirl will gradually cease without becoming destructive, as the deflection of all moving bodies to the right in the northern hemisphere (by a force due to the earth's rotation) causes the wind to rush in more and more nearly radially.

The writer has seen one well-marked case of this kind. If the whirl is started in the reverse direction, and the unstable conditions are sufficiently widespread, the tornado will result. In the latter case the deflection of moving bodies to the right in the northern hemisphere will develop the whirl. As the air rises in the vortex, it expands, and cools. Its moisture is condensed to rain and snow. This snow is carried upward and outward, and finally falls down into the lower winds which feed into the vortex, where it is again carried up, passing first into a region where water is condensed upon it, which again freezes at higher altitudes. This may be repeated many times for some of the hailstones, and they thus acquire very large dimensions. Occasionally stones will jostle against each other and freeze together, forming large masses. The action of the whirl throws the stones into rotation either around the shorter axis of the hailstone, or around the centre of the whirl. In general both rotations will exist at the same time, so that Ferrel's explanation fully accounts for the discoidal or lens-like forms so common in hailstones, and it also accounts for the fact that hail-storms run in narrow belts.

In the throat of the vortex there may be a large accumulation of water, held up by the ascending currents. The amount of water thus held will depend upon the humidity of the air. It may be very large indeed, and the dispersion of the vortex gives rise to the well-known "cloud-bursts," where the water has been known to pour down in streams, washing holes several feet in depth into the soil. Mr. Ferrel's paper is largely expressed in mathematical language and seems to be somewhat unfamiliar to the general public, but it is certain that it explains fully all the phenomena of the tornado and the formation of hail, and is not open to any objection. He proves beyond all question that the effect of unequal temperatures is sufficient to account for the results, and this cannot be said of any explanation before offered.

WASHINGTON UNIVERSITY, November 23, 1882.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

Highest barometer during month, 29.80 on the 2nd. Lowest barometer during month, 28.41 on the 30th.

Highest temperature during month, 78° on the 30th. Lowest temperature during month, 14° on the 15th.

Highest velocity of wind, 45 miles per hour. Total travel during month 9206 miles.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	Oct. 20th to 31st.	Nov. 1st to 10th.	Nov. 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	38.8	39.6	24.0	34.1
Max	68.2	64.6	53.4	62.1
Min. and Max	53.5	52.1	38.7	48.1
Range	29.4	25.0	29.4	28.0
TRI-DAILY OBSERVATIONS.				
7 a. m.	41.8	47.7	32.9	40.8
2 p. m.	66.3	60.8	40.5	55.9
9 p. m.	53.5	53.1	35.4	47.3
Mean	53.8	53 6	36.1	47.8
RELATIVE HUMIDITY.				
7. a. m.	.90	.81	.61	.77
2 p. m.	.47	.58	.64	.56
9 p. m.	.60	.76	.78	.71
Mean	.66	.72	.68	.69
PRESSURE AS OBSERVED.				
7 a. m.	28.90	29.02	29.09	29.00
2 p. m.	28.85	28.98	29.08	28.97
9 p. m.	28.89	28.99	29.13	29.00
Mean	28.80	29.00	29.10	28.99
MILES PER HOUR OF WIND.				
7 a. m.	7.5	9.8	8.5	8.6
2 p. m.	14.6	8.5	17.0	13.4
9 p. m.	11.0	9.1	10.0	10.0
Total miles	2533	3676	2997	9206
CLOUDING BY TENTHS.				
7 a. m.	.23	.44	.37	.35
2 p. m.	.33	.74	.57	.45
9 p. m.	.36	.54	.35	.41
RAIN.				
Inches	.00	.00	1.25	1.25

ANNUAL GROWTH OF TREES.

A. L. CHILD, M. D.

Are the concentric rings of a tree a reliable record of its age in years? Such has been the conception—in fact, the undisputed knowledge—of the world, for all time past. I have no recollection of ever having seen or heard the authority of this record disputed till Desire Charnay, in his "Ruins of Central America," said, when speaking of the age of the ruins as proved by such a record: "Unfortunately for the argument, it is altogether fallacious and proves nothing. I have put the evidence to a test. On examining a slice of wood of a shrub that I knew as a fact was only eighteen months old, I found that it had eighteen concentric rings. I thought it was an anomaly, but, in order to convince myself I experimented upon trees of all kinds and sizes, and invariably found the like result produced in very nearly like proportions."[1]

M. Charnay's statement was, in my estimation, rather loose, and lacking in the proof of his absolute knowledge of the age of the trees examined; and again, so far as applicable to the case, was only so in a tropical climate, where the conditions were entirely different from those surrounding us in a higher latitude, and altogether raised but little doubt on the subject.

In April of 1871 I planted a quantity of the seed of the common red maple (*Acer rubrum*). In transplanting, in 1873, they were placed too near each other, and it has become necessary to cut a part of them out. While cutting, I noticed that the concentric rings were very distinct, and it reminded me of M. Charnay's statement. I took sections from the butt-end of each tree (four of them) and dressed the ends off at an angle of some 35° with the line of the body, thus largely increasing the exposure of each ring, and then counted them.

The situation, exposure, and condition of these four trees were, so far as I could see, identical. I had personal and positive knowledge that they had each twelve years' growth upon them, and I could count on each of the different sections from thirty-five to forty concentric rings. True, I could select twelve more distinct ones between which fainter and narrower, or sub-rings, appeared. Nine of these apparently annual rings on one section were peculiarly distinct, much more so than any of the sub-rings; yet, of the remaining, it was difficult to decide which were annual and which were not.

The thickness of these annual rings varied from two and one-half millimetres to twenty-eight. This measure, of course, gave more than double the real thickness; but was preferable to a right-angled measure, as it gave better facilities for exactness, and yet preserved the proportion between the several rings unchanged.

Now, to ascertain what relation or connection there might be between the meteorology of the several seasons and the growth made during the same, I se-

1 "North American Review," September, 1881, p. 401.

YEAR.	MARCH.				APRIL.				MAY.			
	Maximum temperature	Minimum temperature	Mean temperature	Rain-fall.	Maximum temperature	Minimum temperature	Mean temperature	Rain-fall.	Maximum temperature	Minimum temperature	Mean temperature	Rain-fall.
	Deg	Deg	Deg.	In.	Deg	Deg	Deg.	In.	Deg	Deg	Deg.	In.
1871	.....	.....	42·80	·40	.....	.....	59·60	1·80	.....	.....	66·80	2·40
1872	.....	.....	32·70	1·40	.....	.....	47·70	2·40	.....	.....	57·10	4·40
1873	74	—4	36 37	·70	78	26	45·22	15·90	89	41	59·11	19 00
1874	60	7	32·15	2·51	88	12	44·65	4·09	92	38	67·48	3·15
1875	72	—3	29·11	3·38	84	20	44·81	4·62	96	25	71·00	3·98
1876	60	—4	27·92	2 09	83	30	51·12	5·16	88	35	63·73	3·10
1877	75	0	32·46	1·01	79	22	49·27	5·88	84	35	59·06	7·57
1878	81	19	46·74	3·09	83	31	53 95	4·01	81	32	57·49	5·54
1879	85	1	40·78	2·15	80	12	52·32	2·17	91	34	65·84	5·94
1880	82	—16	36·42	·56	93	28	52·26	·74	94	42	69·41	5·58
1881	58	1	26·63	1·31	81	4	43·70	4·09	85	39	67·03	6·57
1882	80	2	39·16	1·11	86	29	50·76	3·92	82	34	54·85	4·49

YEAR.	JUNE.				JULY.				AUGUST.			
	Maximum temperature	Minimum temperature	Mean temperature	Rain-fall.	Maximum temperature	Minimum temperature	Mean temperature	Rain-fall.	Maximum temperature	Minimum temperature	Mean temperature	Rain-fall.
	Deg	Deg	Deg.	In.	Deg	Deg	Deg.	In.	Deg	Deg	Deg.	In.
1871	.....	.....	76·60	2·30	.....	.....	76·40	14·10	.....	.....	74·60	3·30
1872	.....	.....	73·06	4·70	.....	.....	75·17	7·40	.....	.....	74·53	·90
1873	94	60	75·08	4·80	96	59	75·54	6·40	105	49	77·98	1·00
1874	94	44	74·31	18·02	113	55	82·35	1·10	111	53	78·71	1·40
1875	95	43	71·20	13·58	97	57	74·13	6·72	86	51	69·68	8·40
1876	94	44	68·63	4·58	95	54	75·71	7·44	92	51	74·18	8·39
1877	90	40	67·45	6·41	94	48	73·34	2·20	94	52	71·75	4·56
1878	86	44	66·39	9·64	94	55	76·91	11·61	95	52	75·27	1·23
1879	90	41	70·51	5·05	94	56	75·84	3·10	94	50	73·71	2·16
1880	92	45	71·80	1·57	93	51	75·19	4·73	95	41	74·00	5·42
1881	96	50	73·32	3·99	98	54	76 45	3·68	102	58	78·90	1·42
1882	92	43	69·23	5·77	89	48	68·48	4·26	88*	48	70·77	1·26

* Only twenty days of August included.

YEAR.	Mean temperature of six months.	Total rain of six months.	Growth of wood in millimetres.
	Deg.	Inches.	
1871.....	65·81	24·30	10
1872.....	55·57	20·70	10
1873.....	61·00	46·99	12
1874.....	63·32	30·37	7
1875.....	63·71	40·68	28
1876.....	60·33	30·76	8
1877.....	59·c8	27·72	7
1878.....	66·33	35·12	4
1879.....	63·18	20·57	3½
1880.....	61·47	18·70	8
1881.....	61·03	21·04	3
1882.....	56 18	20·81	2½

lected from my meteorological records the maximum, minimum, and mean temperature, and the rain-fall, of the six growing months of spring and summer of each of the twelve years of growth. These extracts I have tabulated, and have also appended to each season the thickness of the ring formed, as measured on the oblique cut previously described.

An examination of this table shows a general relation of cause and effect between high temperature and large rain-fall, and greater growth. But it falls very short of proving a general law of "so much heat and so much water during the growing season, to produce so much wood." For example, compare the years 1875 and 1878. The temperature of 1878 for the season is better than 4° in excess of the season of 1875, and the rain-fall only a little over four inches less; and yet the growth of 1875 is *seven times* what it was in 1878. This almost unparalleled growth of 1875—that is, as compared with the other years—cannot be explained by the above general law. But I think the May and June record of that year throws light upon it. We see there a maximum heat in May of 96° (higher than I have ever known it in an observation and record of twenty-five years), and a mean temperature of the whole month, also unequalled, of 71°; and this great heat continued through the month of June, and no cold spells after the heat set in sufficient to check the growth. Then, in connection with this heat the ground is well saturated with water when this heated term began (May 6th) by 1·62 inch of rain on the 4th. From this on, to the 26th day June, 15 inches more of rain fell, so apportioned over the time as to keep the ground saturated. This synchronous excess of heat and water evidently produced the abnormal growth. And probably, as this matter is further studied, it will be found that these agents, rightly proportioned, operating synchronously, produce these thicker rings; while as one or the other is in excess, or absent, the growth is checked, and thus has time to condense and harden, and form these sub-rings; and the more frequent these alternations, the greater the number of them.—*Popular Science Monthly, Dec. 1882.*

GEOLOGY.

SUPPOSED JURA-TRIAS OF THE FRONT RANGE OF COLORADO.

JOHN K. HALLOWELL, DENVER, COLO.

I feel that the actual existence of the Jura-Trias in Colorado is so questionable, that after giving what authorities I have at hand, I desire to call attention to a fact or two; and also record a recent discovery in the sandstones of the St. Vrain, Colo., hoping it may lead to the further investigation, by those more able

to deal with the uncertainty than I, and perhaps be the starting point of arriving at a definite enough knowledge to settle the matter.

In "Hayden's Geological Report of Colorado, 1876, p. 107," in reviewing his labors of previous years, he says: "All along the Front Range the Triassic "beds occupy prominent similar positions, until toward the south, they no "longer appear; west of the Front Range they also occur, but not so continu- "ous as at the locality first mentioned. It appears that at but very few places "the Triassic waters could extend westward of the main axis of the Front Range, "but they found ingress at other points. In their lithological character the strata "of the Triassic formations are very constant; so thoroughly complete is this "constancy that it is no exaggeration to say that the formation can readily be rec- "ognized at a glance."

In "Dana's Geology, p. 406," occurs the following: "There is still some "doubt as to the age of the beds of the Rocky Mountains referred to the Triassic "period. Although very widely distributed over the eastern slope south of the "parallel of 38°, they seldom contain fossils; and the few found—occasional "pieces of fossil woods—are not sufficient to settle the question."

In a foot-note, page 447, "Leconte's Elements of Geology," is stated, "In "Colorado, in strata referred by Marsh to the Wealden or uppermost Jurassic, "but by Cope to the lower Cretaceous, a number of immense Dinosaurs have "recently been found; also, by Marsh a small marsupial mammal allied to the "opossum, and about the size of a weasel, which he calls *Dyatestes piscus*."

Now we will go a little farther east and take the Dakota Red Sandstone, (No. 1 of the Cretaceous Group), horizon from the Platte River in Nebraska, south through Kansas to the Arkansas River. Throughout this section in a nearly north and south line, it is resting the whole length on the last sedimentary rocks from the east, viz. the Permian. It must here be noted that the Permo-carboniferous sediments were derived, in a measure, from the wearing away of exposed strata to the east; while the Dakota sandstone sediments came from the west; and here two geological sections meet; each having its own types and peculiarities.

Nowhere can I find it recorded that any Jurassic, or Triassic strata appear between these two rivers, to the east of the Colorado State-line, but throughout the Jura-Trias is entirely wanting, and the sandstone of the Cretaceous rests on the Permian rocks, and I believe conformably to them also; and these are the last of the series of the old Carboniferous group of the east.

Now if there was no cause in existence to produce a deposition of Jura-Trias along this horizon, there certainly was no cause to produce it between the same latitudes farther west and have it show, as claimed it does, uptilted along the Front Range of Colorado.

True, it is mentioned in many places in the U. S. Geological Survey of the State, that the supposed Jurassic and Triassic strata rest upon Carboniferous rocks, and show conformability therewith; so they do, but the coals below them are the coal-beds of the Cretaceous, and not the known coals of the Carboniferous

series of the east: a very large point was strained here to make rock series fit I think.

Again, through this Front Range section that I speak of, it was thought that one of the sandstones showing was the Dakota sandstone; this must be an error as it is not there.

These matters have troubled me greatly, and it is only by leaving Jurassic and Triassic formations entirely out that I could get at any satisfactory solution of this rock-structure in the named locality.

In "Hayden's Report, 1873, p. 136," is stated, "The close proximity of "the vertical coal-beds to the horizontal beds of Table Mountain, (a basaltic "mountain) has been taken as representing unconformability between the two, "though in reality it no more follows from this fact, than would unconformabil-"ity in the Triassic from the similar phenomena presented on Coal Creek."

On the same page in the paragraph just above the one quoted is stated, "A "few miles north of Golden City a very remarkable contraction of the series "commences, all of the outer ridges bending rapidly westward to form a sort of "loop or bay in the rear of Table Mountain near the narrowest point of which "Golden City is situated. There have been some differing opinions expressed "about the structure of this region, and a section here is one of the most impor-"tant of the series."

Now let the geologist who wants to find the Jura-Trias go to Golden and Table Mountain; he will find the Basalt mountain resting on the Cretaceous shales, with undisturbed strata underneath and east; while west are the uptilted sedimentary rocks (the supposed Jura-Trias) resting conformably on the coals of the Cretaceous, and in some instances almost coming in contact with the foot-hill metamorphic rocks.

Let him examine Table Mountain and it shows a pre-existence to the Rocky Mountain elevation, in fact it existed in the earliest Eocene times. Then examine the heaviest sandstone beds, and they are fine-grained, banded, red and white streaks, or laminæ, alternating nearly equally, very homogeneous in material, no fossil remains, or evidences of sea-life, and every appearance of being produced from one cause, and that cause near by.

The material is volcanic ash, and the cause was just in proximity. The different bands of sandstone, really give the number of eruptions of this volcano; it was a large one then, and sent out intermittingly for a long time its fine ashes, which were blown by the winds over large areas of the surrounding sea, and sufficient of this material was erupted to make beds many feet thick in localities. The variation of thickness was due in a great measure to the unevenness of the sea bottom. This material being depositedi ntermittingly, prevented any sea-life existing at this place, consequently there are no fossils.

But this volcano had a period of rest, for the geologist will find on top of the first sandstones, a bed of conglomerate; on examination it appears to be fifteen feet thick, and instead of being quartz pebbles as one would naturally expect, it is almost entirely Zeolites; and this shows the long period of rest of this

volcano, as the Zeolites to this thickness could only come from the long wearing away of the Mountain of Basalt. Our volcano, however, was not dead yet, as following the conglomerate is a thin bed of sandstone, volcanic ash, most beautifully lined in alternate bands, very fine and thin, and telling us that it was the last dying throes of one of Nature's giants.

Along the line of this strata it would be quite natural, after what had been done by this volcano, to expect a line of weakness, which broke as the Rocky Mountain system arose and made a fault between Table Mountain and the Front Range. Here the sedimentary strata tilted up and the volcanic eruptive record was preserved; but east of Table Mountain the rocks are all eroded out of what is now the Platte River basin. I could only get this representative section straightened out when I gave up the idea of the Jura-Trias existing here at all.

Again. Professor Rogers, in his admirable Surveys of Pennsylvania, accounts for the depositing of the Triassic of the Atlantic slope, as a deposition of river silt, the waters of which were possibly more or less affected by tides; that this river extended from the New England States in the north down what is now the Atlantic slope to Georgia, the deposit culminating in its greatest thickness in Virginia. I cannot find evidence for an analogy to this in the Colorado Front Range.

The characteristic fossil representations of the Trias of the Atlantic slope are the foot-prints occurring in the sandstone bordering the Connecticut River of which over 12,000 tracks have been found, averaging 100 tracks for each individual animal known. Comparative anatomists are agreed, that these are the foot-prints principally of reptiles or *cold-blooded* animals. This fact is used by geologists to illustrate the theory of evolution as evidenced by the geological formations of the different periods of the earth. In a lecture in Denver some months ago this subject was clearly and beautifully treated by Professor W. D. Gunning, of Boston, (such theories appear to be his strong forte). To the attention of this gentlemen I presented a discovery of my own, made a short time before his arrival, in some sandstone flagging put down on 16th Street in Denver. The discovery was made in April, 1882, and consists of three distinct sets of foot-prints, made evidently by three different animals.

Professor Gunning verified them as foot-prints on the spot, and this I believe to be the first recorded discovery of the kind. They are in the sandstones of the St. Vrain quarries of the Front Range of Colorado.

The largest foot-prints were evidently of an animal going at a leisurely gait across the wet sands, leaving a record as distinct and perfect as a fox would under similar circumstances in a snow-field. One of the smaller sets have the whole four feet drawn together, as if the animal had just alighted after a spring, and paused a moment to listen and see if the cause of his alarm still continued. Afterward, in the stone-yard, I found one large slab with just two tracks upon it, similar to the ones first mentioned, but impressed by an entirely different action. Instead of a leisurely trot, he had been in a hurry, and had in his jumps come down upon the wet sand heavily; as he sprang forward his nails scratched deep-

ly into the sand and left a record to prove that his age of life was not Triassic, but was long after the close of the Cretaceous age. For those are not the tracks of cold, but of warm-blooded animals; and my friend was evidently an active member of the great family called *Canis*.

I desire to put this discovery, crude as it is, on record, that the attention of men of more time and means than myself and be directed to it, and so help settle a long-standing doubt, which appears to exist, even in the minds of those who found the Triassic formation so constant here in these typical sections "that it is no exaggeration to say it can readily be recognized at a glance."

From the extracts given, and the facts herein noted by myself, I feel that all of my readers will recognize the difficulty I had in finding the Jura-Trias when I examined the very sections pointed out in the U. S. Reports, and why I had to come to the conclusion that they do not exist at all.

GEOGRAPHY.

BOLIVIA A NEW SOURCE FOR RUBBER.

The principal facts given below were first published in the REVIEW with a map of the Beni River region explored by Dr. Heath, in the September Number of 1881, in an article entitled "Explorations in South America." Both Dr. E. R. Heath and his brother Dr. Ivon D. Heath have contributed to the REVIEW articles of great value, during the past three years, upon the geography, climate and archæology of South America, and we are glad to see that their work is beginning to be equally appreciated elsewhere.—ED. REVIEW.

Dr. Edwin R. Heath has given a reporter of *The World* an account of his recent explorations of the Beni River, in Bolivia and the adjacent country. To Dr. Heath belongs the credit of being the first to make a complete exploration of the River from its source at La Paz to its junction with the River Mamore. He has made many discoveries of geographical interest, such as locating the mouths of the Madre de Dios and the Orton Rivers. He has collected also much material of value to the zoölogist, botanist, and geologist, and a full account of his researches will shortly be published by the American Geographical Society and the Royal Geographical Society of England. The commercial value of his discoveries is that he has established the fact that the Beni River is navigable by large steamers from its mouth to near Reyes, a distance of 525 miles, and for 300 miles further by craft of less than three feet draft. At its mouth the Beni River is a little over half a mile wide and 50 feet deep at lowest water. At Reyes it is 800 feet wide and 30 feet deep.

The country adjacent to the lower Beni produces cacao beans, vanilla beans, Brazil nuts and many other useful articles of commerce. The waters of the upper Beni run through a country that produces Peruvian bark, cacao, coffee, gold, silver and copper.

The commercial product of the country adjacent to the lower Beni, which promises the richest development in the future is rubber. "The supply of rubber to be obtained in this region," said Dr. Heath, "is practically inexhaustible. On the north side of the Beni River the forest extends from the water's edge over 15° of latitude. I penetrated this dense forest at one place as far as twenty-one miles from the river, and the further I went inland I found the rubber trees increase in size and number. Each square league contains from 300 to 5,000 trees. On the south side of the river the forest is only from three to ten miles wide, but it abounds in rubber trees."

Dr. Heath left Reyes for the mouth of the Beni, August 4, 1880, and arrived at its junction with the Mamore October 11th. The first part of the voyage war made in a canoe propelled by eight Indians, the latter part in a canoe with two Indians. The actual time occupied in paddling down the stream was a little over five days, the rest of the time being devoted to an examination of the adjacent country and to collecting and noting objects of interest. On August 7th, Dr. Heath was compelled to lie to near a sand-bar on account of what the natives call a south wind, which is similar to the "norther" of Texas The journey was resumed on the 8th. On either side of the river was found a mass of dense foliage extending to the water's edge, like the forest on the Amazon. At low water there are many sand-bars in the river, where turtles deposit their eggs in great numbers. They were much relished by the Indians, but Dr. Heath found them strong and oily. On the 8th River Tarene was passed and many tigers were seen. The favorite food of the voyagers was roast monkey. Dr. Heath pronounced the flesh excellent, superior to that of any other animal food. The monkeys were found in abundance throughout the voyage. What is called the black spider monker is regarded by connoisseurs in monkey flesh as most tempting to the appetite. The monkey that is to be prepared for the meal is placed for a moment over a brush fire. This blisters the skin and the hair is readily scraped off.

On August 14th Cavinas, a small mission station, was reached. Here they encountered some Arauna Indians who are reputed cannibals. They are of a low order of intelligence, small of stature, with skin dry and wrinkled. Dr. Heath was told that one of these Indians in the neighborhood went out hunting, and returning empty-handed deliberately killed and cooked his infant child, and he and his wife sat down to the repast without any compunctions of conscience. These Indians live upon the banks of the Madre de Dios and occasionally make excursions to Cavinas, murdering Indians of the Cavinas tribe, presumably eating eating them afterward. Some hundred miles below Cavinas are found the Pacavara Indians. These Indians are peculiarly well formed, their features being regular, and some of the women are deserving of being called beautiful, their complex-

ion being a light copper-color. In intelligence they are also superior to other tribes of Indians found in that region. Alligators of various sizes are found to abound on the Ceni River, and they caused much annoyance by frequently stealing provisions from the boat at night while the exploring party was encamped on the bank. Insect pests were numerous. A species of sand-fly called the marnim preyed upon them during the day and the mosquitoes stung them at night. They were also subject to the attacks of the tabino fly, a species of horse-fly of which there are two varieties, one black and the other yellow. They are at about latitude 10.50 south. From thence to the Amazon the marnim fly abounds.

After reaching the Mamore River, October 11th, Dr. Heath ascended that stream 325 miles to Exaltacion, and from that point crossed the plains to Reyes. From thence by rafts he ascended the Beni River to within ninety miles of its source at La Paz, and covered the remaining distance on mules. Previous to the discovery by Dr. Heath that the river was navigable the products of the region were transported to Arica and thence by sea around Cape Horn to Europe, or otherwise across the pampas to the Mamore River, thence down the Madeira to San Antonio, to which point steamers at present ascend. The Beni has an advantage over the Mamore as a highway of commerce in having only one fall, while the Mamore has five such obstructions. "Soon after the results of my explorations became known," said Dr. Heath, "the tide of commerce began to seek the Beni route." All the commerce of Bolivia must ultimately pass to Europe by way of the Amazon and Beni Rivers.

Dr. Heath said that within four years a railroad would be constructed from San Antonio to the Beni River a short distance above its junction with the Mamore River. By this means the falls of the Madeira are avoided. The route for commerce will then be from Reyes by steamer to where the railway taps the river, then by rail to San Antonio and from that place by steamer down the Madeira to the Amazon and onward to the sea.

As an instance of the impulse which the opening of the Beni River has given to commerce, Dr. Heath mentioned that previous to the discovery that the river was navigable 185 men were employed in collecting rubber gum. Soon after the discovery was made 644 men speedily found employment at it. The price of the gum before the exploration was $16 per 100 pounds delivered at Reyes; after the exploration it was worth $25.60 at the point of collection. The 185 men collected on an average 104,000 pounds of rubber annually.

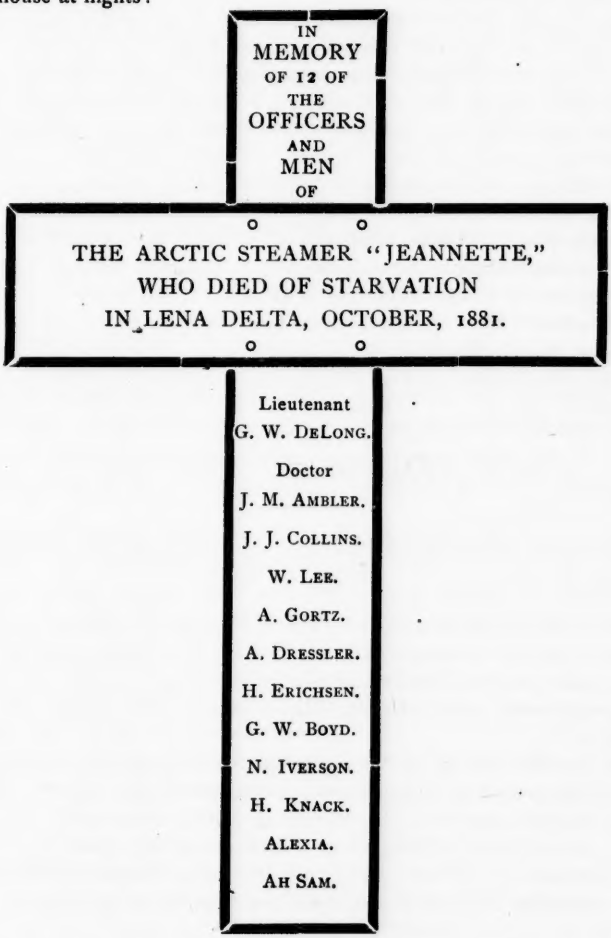
"The supply of rubber," said Dr. Heath, "is sufficient to give employment to 100,000 men, and as soon as the chain of communication by steamer and railway is completed that number of men will be engaged in that field of labor. The rubber, though at present commanding only the same market price, is of a slightly finer quality than that obtained at the old established districts between the falls and the mouth of the Madeira River and on the River Tapajoz and other tributaries of the Amazon near Para. It possesses other more important advantages over the older districts. The climate is healthy. There is an abundant supply of cheap labor at hand, the Indians obtained from the depart-

ment of the Beni, who are practically slaves, working at from $3 to $4 a month, equivalent to from $2.40 to $3.20 in American money.

The abundant supply of palm-nuts which are used in smoking the rubber—a necessary process previous to evaporation—enables the collectors to work ten months out of the twelve, instead of six as in other districts.

HOW DE LONG AND HIS MEN WERE BURIED.

On the cross is engraved the following inscription, cut in by the search party at their house at nights:



It was Chief Melville's intention to bury the remains upon the bank where they were found, but the natives assured him that in all probability any tomb would be washed away, as when the river broke up in the spring there would be about four feet of water over the entire delta. He, therefore, had them all removed to the top of a hill of solid rock about three hundred feet high, about forty versts to the southwest, and there constructed a mausoleum of wood from the wreck of the scow near where they were found. First a gigantic cross was hewn out of a solid piece of driftwood and erected on the crest of the hill, and around it was built a box six feet wide, two feet deep and twenty-two feet long, placed exactly in the magnetic meridian. After the bodies had been placed therein the box was covered with timbers laid side by side and a ridge pole sixteen feet long framed into the cross five feet above the lid of the coffin, the ends supported by timbers having the same inward slant. Against this ridge pole were placed timbers side by side until the whole formed a true pyramid, and then stones were heaped upon the entire structure, so that it looks like a pyramidal mound of stones surmounted by a cross. The cross itself is twenty-two feet high from the surface of the rock, is one foot square, and the crossbeam is twelve feet long by one foot square.

Chief Melville has made arrangements to have the pyramid sodded this spring, under the direction of the commander at Bulun, in case he has finished his search in time to escape before the breaking up of the rivers. The structure is a very creditable affair and conspicuous from the river at a distance of twenty versts.—*Cor. N. Y. Herald.*

PROCEEDINGS OF SOCIETIES.

FIFTEENTH ANNUAL MEETING OF THE KANSAS ACADEMY OF SCIENCES.

The Kansas Academy of Science met at Topeka on Thursday, November 16th, and remained in session until the evening of Saturday, November 19th. The preliminary meeting was held as usual at the office of Dr. A. H. Thompson, Thursday afternoon, where only the ordinary routine business was taken up and disposed of.

The committee on the Mudge monument fund reported the monument completed, the grounds in good shape and a surplus left in their hands. It was decided on motion to use this money to take care of the monument and grounds.

The committee on a State geological survey made a preliminary report and further discussion and action upon the subject was postponed until Friday.

A committee was appointed upon the nomination of officers to report Friday.

In the evening the members were handsomely entertained at the residence of Mr. Geo. S. Chase. The beautiful collection of minerals which Mr. Chase has gathered attracted no small attention, and the hospitality of the hostess and her lady friends were highly appreciated.

SECOND DAY'S PROCEEDINGS.

Pursuant to adjournment, the Academy met in the Senate Chamber at nine o'clock A. M. Friday. The President, J. T. Lovewell in the chair.

An election of officers for the coming year was entered into with the following result: President, A. H. Thompson; Vice-Presidents, J. R. Mead and G. E. Patrick; Secretary, E. A. Popenoe; Treasurer, R. J. Brown.

The following committees were appointed: Geology, O. H. St. John, Jos. Savage and Rob't Hay; Mineralogy, Geo. S. Chase, G. E. Patrick, G. H. Failyer, J. C. Cooper and E. Haworth; Chemistry, G. H. Failyer, G. E. Patrick, J. T. Lovewell, R. J. Brown and H. E. Sadler; Physics, J. T. Lovewell, H. S. S. Smith and S. D. Graham; Anthropology, A. H. Thompson, F. G. Adams, E. P. West, J. D. Parker, W. J. Griffin and H. Inman; Philology, D. H. Robinson, Geo. M. Stearns and Geo. T. Fairchild; Board of Curators, E. A. Popenoe, O. H. St. John, J. T. Lovewell and F. H. Snow; Publication Committee, J. T. Lovewell, Wm. Sims and E. A. Popenoe.

Following the election of officers, the Academy took under consideration the appointing of a committee to memorialize the Legislature on the subject of a geological survey of the State. This committee will have in charge a subject of the highest importance, and quite a full discussion ensued, which was participated in by Profs. Patrick, Carruth, Lovewell, Goss, and Drs. Brown, Thompson and Geo. S. Chase. It was decided to enlarge the committee to five with a further advisory committee of ten members, who shall have the matter in charge in various parts of the State. The names of this committee will be announced hereafter.

A valuable paper upon the "Coal Fields of Cherokee County, Kansas," was read by Erasmus Haworth, of Empire City, which, showing the careful investigations of the subject made by the author, was listened to with close attention by the Academy. In this paper Mr. Haworth spoke of the undeveloped mineral wealth existing in various localities, and emphasized the importance of a geological survey of the State. At the conclusion of the reading of this paper, remarks being called for by the chair, an interesting discussion ensued, participated in by Prof. Patrick and others.

Some interesting remarks were made by Prof. J. T. Lovewell on the "Differences of Temperature due to Local Causes," that gentleman expressing the regret that he had not been able to collect the data necessary for the preparation of the paper upon the subject which he had promised the Academy.

In the absence of Prof. Robt. Hay, of Junction City, an interesting paper contributed by that gentleman on "Fossil Wood," was read by the Secretary. In this paper the writer spoke of some interesting specimens collected by him on

the Saline, in Russell County, and in various parts of the State. The conclusion drawn by Mr. Hay was that all his researches "pointed one way, namely, to the cretaceous origin of most of the specimens of fossil wood found on our prairies."

Prof. Patrick exhibited two rare minerals found by him last summer while in New Mexico, giving an interesting oral description of the discovery of the same, together with the classification of the rare specimens in his collection. The two minerals in question are vanadates of lead, containing the rare mineral vanadium. One is supposed to be Dechenite. a mineral discovered in Bohemia, and thus far hardly ever found elsewhere. The species of the other mineral has not yet been determined, as it differs in appearance from all the known vanadates.

AFTERNOON SESSION.—Academy convened at two o'clock P. M. President Thompson in the chair. An increased attendance, including a number of ladies.

Prof. Carruth gave an interesting account of a recent visit to the southwestern part of the State in quest of additional botanical specimens. The species of flora known to Kansas botanists Mr. Carruth stated to be 1,400, of which 200 are not found in Wood & Gray's botany.

A thoughtful paper upon "Kansas Ethnography," designed as an introductory paper, was read by Dr. A. H. Thompson, which was listened to with close attention, giving rise to an extended discussion, participated in by Messrs. Inman, Snow, and others.

Professor Snow made some highly interesting remarks upon the "New Kansas Coleoptera," and presented a list, which called forth an animated discussion.

A carefully prepared paper upon "Are there Igneous Rocks in Kansas?" in opposition to the theory, was read by Mr. Erasmus Haworth, which called forth an animated discussion, participated in by Messrs. Patrick, Inman, Snow and others.

Mr. Haworth showed some beautiful specimens of the copper ore, "Chalcopyrite," found in Cherokee County, which has not before been found in Kansas.

Professor Snow exhibited a specimen of the Gila monster, *Heloderma suspectum*, captured by him last summer while in New Mexico, an animal held in great dread by the natives and regarded by them as being highly poisonous, which the Professor declared was erronous; giving a humorous account of sundry experiments which he had made with the animal to test this fact.

EVENING SESSION.—A fine audience greeted the Academy in the evening, to listen to Professor H. S. S. Smith's paper on comets. This gentleman's subject was ably and carefully handled. He advanced no new theories, but presented seriatim the popular views in relation to comets in the olden time, when astronomy was crudely understood, and the most advanced idea of to-day relating to these strange celestial visitors. He seemed to argue most favorably for the electrical theory, though he admitted that all was conjecture and that nothing was known positively of their origin or purpose. The lecture was listened to attentively, and at its close provoked some pleasant and instructive discussion by several of the members present. [A portion of this paper is presented to the readers of the REVIEW on pages 465 to 467 of this number.—ED. REVIEW.

THIRD DAY'S PROCEEDINGS.—Having failed to receive the report for Saturday, we are compelled to go to press without it. The papers read were as follows:

Notes on the Golden Turkey, (*Meleagris ocellata* CUV), Prof. Geo. F. Gaumer, Santa Fe, N. M. Preliminary List of the Invertebrate Fossils of Kansas, Geo. S. Chase, Topeka. Cremation, Dr. W. S. Newlon, Oswego. New Kansas Coleoptera—chiefly from Douglas County, Prof. F. H. Snow, Lawrence. Foot-Prints in the Pleistocene, Henry Inman, Topeka. Las Vegas Mineral Waters, Prof. J. T. Lovewell. List of Coleoptera Collected in Gallinas Cañon, N. M., in July and August, 1882, Prof. F. H. Snow. List of Lepidoptera Taken in Gallinas Cañon, July and August, 1882, Prof. F. H. Snow. A Plea for Our Little Birds, N. S. Goss, Topeka. Protozoan Remains in Kansas Chalk, Prof. G. E. Patrick. Standard Time, Prof. H. S. S. Smith. On Some American Species of Cyclops, Prof. F. W. Cragin, Topeka. Notes on the Gila Monster, (*Heloderma suspectum*, COPE), Prof. F. H. Snow. Aborigines in Kansas, F. G. Adams, Topeka. The Pictured Rocks of Pipe Creek, Silas Mason, Delphos. Observations on the Nesting Habits of the Guillemots, etc., at Bird Rock, N. S. Goss, Topeka. New Species Added to the List of Kansas Plants, Prof. J. H. Carruth.

It was voted that in future one of the evening addresses before the Academy at its annual meeting be given by the retiring President, also that the chairman of each of the Commissions be asked to report to the Academy the progress made in his specialty during the year.

BOOK NOTICES.

MANUAL OF BLOW-PIPE ANALYSIS. By H. B. Cornwall. Illustrated; 8vo. pp. 308. D. Van Nostrand & Co., New York, 1882.

Professor Cornwall has charge of the departments of Analytical Chemistry and Mineralogy in the John C. Green School of Science, College of New Jersey, where he has had large experience in teaching the use of the blow-pipe as well as all other appliances of modern analytical methods. This work contains the practical results of his experience and study and will be found eminently useful both to students and instructors. It will also be found of great value to actual workers in the mining regions of the West where the examination of complex ores and new minerals are so frequently necessary and the delay consequent upon sending specimens to distant chemists and assayers is a serious objection.

Beginning with directions for self instruction, lists of substances for practice and of apparatus for qualitative blow-pipe analysis, the author proceeds to describe minutely, with numerous illustrations, the apparatus, reagents and operations in ordinary chemical work. After this preliminary chapter he takes up

seriatim the special operations and examinations by means of the blow-pipe, such as the management of the flame, the blast, the oxidizing flame, the reducing flame; examinations in closed and open tubes and on charcoal alone; examinations for fusibility, alkilinity, flame coloration, with glass fluxes, with soda, with cobalt solution, etc.; tables showing the behavior of the alkalies, the earths and the metallic oxides. Chapter III is devoted to special tests for the elements or their compounds necessary in some combinations, and comprises fifty-five pages. Then follow the instructions for systematic blow-pipe examination of substances, including the excellent scheme of Prof. Egleston, with explanatory notes and with some alterations by the author; also of metallurgical products and paints. Chapters are also devoted to analysis with the aid of the wet way and spectrum analysis. One of the most important chapters in the whole book is that upon Quantitative Blow-Pipe Analysis, or Assaying, in which the subject is fully treated, there being directions for the assaying of gold, silver, copper, lead, bismuth, tin, cobalt, nickel, and mercury. Chapter VIII comprises descriptions of the more important ores and coals, while the remainder of the work is taken up with a treatise upon determinative mineralogy with explanatory remarks upon minerals, formulas, systems of crystallization, cleavage, hardness and tenacity, lustre and color, streak, magnetism and pyro-electricity, action of acids, specific gravity, fusibility, method of using the determinative tables, etc. His remarks upon classifying examination are divided into minerals with metallic or sub-metallic lustre and minerals without this lustre, with proper and lucidly explained divisions. All the detailed processes are simple, easily understood and readily performed by students or others having an elementary knowledge of inorganic chemistry and a reasonable degree of expertness in handling apparatus. The indexes are full and satisfactory, which is no small desideratum in such a work. We can unhesitatingly recommend it as a reliable guide for all persons who desire practical information and instruction upon the important branches of metallurgical knowledge to which it applies.

ANTS, BEES AND WASPS. By Sir John Lubbock, F.R.S., LL.D., etc. 12mo. pp. 448, Illustrated. D. Appleton & Co., N. Y., 1882. For sale by the Kansas City Book and News Company. $2.00.

This is the forty-second volume of the International Scientific Series, which now comprises some of the very best works in all departments of science ever brought together in one continuous set. Several of these have been noticed in these pages from time to time and the series has met with a ready sale in this community.

Sir John Lubbock has for a number of years given the study of ants, in particular, a great deal of attention and his articles have been published and copied all over the world. In the present work only two chapters are given to bees and wasps, since, as he says, he found that ants were more convenient for most exper-

imental purposes, as well as having in his judgment more power and flexibility of mind and a far calmer and less excitable disposition.

In this work he has reproduced the substance of two Royal Institution lectures, which include apparently pretty much the whole subject, and much of which is founded on actual observations made upon individual members of ants' nests, or communities, followed up in his own room, where these nests were kept in some instances for more than seven years. It will be a kind of revelation to some readers to know that he has at this time ants in his possession that are more than eight years old, a much greater age than is usually accredited to any insects.

The author's high estimation of the intelligence of these insects is still further shown by the first sentence of his introduction: "The Anthropoid Apes no doubt approach nearer to man in bodily structure than do any other animals; but when we consider the habits of ants, their social organization, their large communities and elaborate habitations; their roadways, their possession of domestic animals, and even, in some cases, of slaves, it must be admitted that they have a fair claim to rank next to man in the scale of intelligence." This seems a bold claim, but perhaps no man has a better right to make it, in view of the time and labor spent by him upon the investigation of the subject. Every branch of it from their classification and structure, their food and dwellings, their habits and characters, to the formation and maintenance of their nests, their relation to plants and to other animals; their behavior to relations, their recognition of friends, their power of communicating; their senses, general intelligence, with his methods of observation, his experiments on all of the above points and the results thereof, is detailed in the most careful, complete and precise manner.

Nothing can be more interesting to any person having the slightest taste for natural history than this account, and we can recommend the book to all such as exceedingly instructive as well as entertaining.

THE DISEASES OF THE LIVER. By George Harley, M. D., F.R.S. Octavo, pp. 751, Illustrated. P. Blakiston, Son & Co., Philadelphia, 1882. $5.00.

In this work, which has been looked for by the medical profession with much interest ever since its announcement, the diseases of the liver, with and without jaundice, are considered, with the special application of physiological chemistry to their diagnosis and treatment. It is generally believed, though with how much basis of fact is doubtful, that diseases of the liver are more prevalent in the West than in the older portions of the American Continent. Whether this is so or not such diseases are sufficiently abundant and little enough understood everywhere to render such a work invaluable to the general practitioner of medicine, especially as it contains a large amount of clinical and scientific data that has never before been collected together by any author into one volume, and in many instances gives a new rendering to old clinical facts by presenting them to the reader in the light of modern pathological science.

The author calls special attention to that portion of the work devoted to the

physiological chemistry of the excretions, on the ground that "we are entering upon the threshold of an important line of medical inquiry which sooner or later will be followed by valuable practical results." Of this there can be no doubt, and the researches of some of our American physicians show that they are not blind to the advantages of this means of investigation.

One conclusion of Prof. Harley's will doubtless be read with surprise, if not doubt, *i. e.*, that mostly all liver diseases are hereditary, even many of those apparently accidentally acquired, such as gall-stones, being no exception to the rule.

As this work is intended only for professional men we will not extend this notice, but merely give a synopsis of its contents to show the scope of the work:

Chemistry, Physics and Physiology of the Liver and its secretions. Etiology of Jaundice—different kinds—causes producing them—treatment. Signs and Symptoms of Liver Diseases. General remarks on all kinds of Hepatic Remedies. Special Hepatic Medicines; their modes of action and uses. Mineral Waters, Wines and Foods; treatment of Pyrexia, Cerebral complications, etc. Congenital and Hereditary Liver Diseases, Biliousness; Its varieties and treatment. Jaundice from Enervation, all its forms explained and their different treatments. Different forms of Inflammation of the Liver and their treatments. Jaundice caused by Diseased Germs, Yellow Fevers, Contagious and Epidemic Jaundice, different kinds and their treatments. Jaundice of Pregnancy. Different forms of Hepatic Atrophy and Ascites. Biliary Concretious, Inspissated Bile, Gall Stones of every kind and form, direct and indirect effects of; their symptoms and treatment. Different kinds of Colics, etc. Catarrhal Jaundice. Jaundice from Poisons. Different kinds of Jaundice from Permanent Obstructions. Physiological Chemistry of the Excretions, Urine and Stools, as a guide to diagnosis and treatment. All kinds of Abscess, Tropical, Pyæmic, Metastatic, etc. Different kinds of Cancers of the Liver and its Appendages. Hydatid and Cystic Diseases of the Liver; Syphilitic and Fibroid Diseases of the Liver. Embolisms, Fatty, Amyloid and other Degenerations of the Liver. Traumatic Diseases of the Liver. Diseases of the Gall Bladder. A concluding chapter, entitled Hints on Differential Diagnosis. Index.

THE THEORIES OF DARWIN. By Professor Rudolph Schmid; 12mo. pp. 410. Jansen, McClurg & Co., Chicago, 1883. For sale by M. H. Dickinson, $2.

In this work the theories of Darwin and their relation to philosophy, religion and morality are so carefully, systematically and learnedly considered, so thoroughly analyzed and so lucidly set forth, that we regard it as the most satisfactory exegesis of the whole subject of evolution and its kindred hypotheses that has ever been presented to the American public. Professor Schmid is President of the Theological Seminary at Schönthal, Würtemburg, where he wrote the work some six years since. It has, however, been recently revised and is now presented for the first time in the English language, having been translated by authority

of the original publisher, by Rev. G. A. Zimmerman, Ph.D., of Chicago, and put forth in elegant shape by Jansen, McClurg & Co.

The work is divided into two parts, the first of which is devoted to the Darwinian Theories, including the purely scientific theories, their rise, history and present state and their philosophic completions and consequences, their naturo-philosophic supplement and the metaphysical conclusions drawn from them.

Part second is devoted to the position of the Darwinian Theories in reference to religion and morality, and comprises an historical and critical account of them, and an exhaustive analysis of them. In this part the Darwinian Theories are taken first in connection with religion, then in connection with morality and considered as to the bearings of the descent, evolution and natural selection theories upon theism or the theistic view of the world, also upon the creation of the world and of man, the primitive condition of man, the hearing of prayer, miracles, etc., the effect of Darwinistic naturalism and scientific Darwinism upon moral principles and moral life. The whole is summed up in a profound, comprehensive and original manner whose fairness and toleration cannot fail to impress all readers, and, as the translator remarks, "must serve an important purpose to the cause of religions, nor less than of scientific truth."

The Duke of Argyll, in concluding his introduction to the work, says: "Knowing the author personally, as I have done for many years, I recognize with pleasure in his work all the carefulness of inquiry and all the conscientiousness of reasoning which belong to a singularly candid and patient mind."

BEAUTIFUL HOUSES. By Mrs Haweis; 12mo. pp. 115. Scribner & Welford, New York, 1882. For sale by M. H. Dickinson, $1.50.

"Fine feathers make fine birds," and fine bindings, fine paper and elegant printing go far toward making fine books. At least, one cannot help feeling so upon looking over the "Parchment Series" and finding such of his old friends and favorites as Shakespeare, Tennyson, Coleridge, Poe, the Eighteenth Century Essays, English Odes, Imitation of Christ, etc., presented in all the attractions of parchment covers, superb hand-made paper and the most perfect typography; visions of elegance and models in style; tributes to refined intelligence within and to cultivated taste without.

Taking the volume above named as an illustration, we find it a fitting exemplar of the progress now being made in art in all its branches, while its charming author has rendered equally conspicuous the advance of esthetics by her tact in selecting subjects and her skill in describing them.

The houses described in this book are those of Sir Frederic Leighton, President of the Royal Academy of Art Mr. William Burgess; Mr. Alma Tadema, the artist; the British Embassy at Rome; Mr. Boughton, in London; Mr. Alfred Moraison; the Villa Campagna at Rome, owned by the well known sculptor, Mr. Warrington Wood, and occupied by him as a studio; Mr. Reuben Sassoon; Ashley Park, an old Tudor mansion, now owned by Mr. Sassoon; Mr. William Haz

letine's apartments in the Palazzo Altieri in Rome; Mr. Stevenson's house, known as the "Red House," and Miss Hozier's Bijou house in London. All of these are minutely and graphically portrayed by Mrs. Haweis in her most artistic and poetic style, so that after reading one feels that he has actually had an experience.

It is impossible to convey this experience to these pages and we must refer the reader to the book itself, assuring him of a rare literary treat as well as a probable expansion and enrichment of his ideas upon modern taste and style in building, furnishing and decorating houses in cases where, as the author says, "exquisite feeling, devotion and knowledge, with all the skill that money and thought command," are brought into requisition.

BRACERIDGE HALL: OLD CHRISTMAS. From Washington Irving's Sketch-Book. Quarto, 48 and 36 pp. MacMillan & Co., London, 1882. 6d each.

The above are excellent reprints of two of the genial Irving's best stories or sketches, and have been brought out in good style by MacMillan & Co. who have spared no pains to make them popular. In addition to firstrate typography, the publishers have had each volume illustrated with more than one hundred wood cuts, which add very materially to their appearance and value.

It is altogether unnecessary to speak of the literary merits of these works. Every American knows and appreciates Irving, who is also a favorite in England, where he spent a considerable portion of his life.

THE DOCTRINE OF THE UNKNOWABLE; WITH A SYNTHESIS. By David Eccles, Kansas City, Mo. 1882; octavo, pp. 22. Price 10c.

Mr. David Eccles, of this city, has recently published in pamphlet form his lecture delivered last summer before the Kansas Liberal Union at Bismarck Grove. It is a bold and somewhat abrupt departure from the beaten track in metaphysics, relegating the doctrine of the Unknowable to a much less prominent position than it has occupied since Spencer enunciated it and substituting for it the assumption that matter and its states are an illusion, having no existence outside of mind; that there is no real of existence besides mind, and that he who knows himself and his sensations knows all; all else being a creation of the senses and having no actuality whatever. From this starting point he constructs a synthesis whose scope includes every mode of matter and motion, giving them corresponding sentiency and culminating in perfect adaptation, which can only abide in "the Great Central Soul." While to us this seems like stepping from the Unknowable to the Inconceivable, (though we suppose all thought must stop at some final mystery and why not as well with Mr. Eccles' incomprehensible mind as with Spencer's fictitious Unknowable, ?) it is the result of a strict metaphysical reasoning and doubtless will satisfy many who have not hitherto been willing to accept the apparent evasions of Spencer in resorting to the Unknowable. It will certainly give Mr. Eccles an advanced position among philosophical thinkers.

OTHER PUBLICATIONS RECEIVED.

Frontier Army Sketches, by Capt. James W. Steele, Jansen, McClurg & Co., Chicago, $1.50; Jewish Nature Worship, by J. P. MacLean, Robert Clarke & Co., Cincinnati, Ohio, 25c; Geological Sketches, Archibald Geike, LL.D., F. R. S.; *Humloldt Library*, No. 38, 15c; Paper-Money Inflation in France, by Andrew D. White, 10c; The Gulf Stream, by Commander J. R. Bartlett, U. S. N.; The Change of Life in Health and Disease, by Edward John Tilt, M. D., P. Blakiston, Son & Co., 75c; Results of Meteorological Observations made in Henry County, Indiana, from 1854 to 1882, by Wm. Dawson.

SCIENTIFIC MISCELLANY.

TRANSIT OF VENUS, DECEMBER 6, 1882.

W. W. ALEXANDER, KANSAS CITY.

The Kansas City mean time of *Internal Contact* at ingress, December 6th, 8h. 04m. A. M. *Internal Contact* at egress, December 6th, 1h. 30m. P. M. Apparent diameter of Venus 64.6″, of the Sun 1952.4″.

DETERMINATION OF THE SUN'S DISTANCE.—We all know when Venus crosses the Sun's disc during its transit it appears as a round black spot, (about one-thirtieth of the Sun's diameter). Let us suppose two observers placed at two different stations on the Earth, properly chosen for observation of the phenomenon; one at a station in the northern hemisphere, another at a station in the southern hemisphere. When Venus is exactly between the Sun and the Earth, the observer at the northern station will see her projected on the Sun; the southern observer from his lower station will see her projected higher on the disc of the Sun. Now, what we require to know, in order to determine the Sun's distance, is the distance between the lines?

If the distance between the two stations is sufficiently great, the planet will not appear to enter on the Sun's disc at the same absolute moment of time at the two stations, and therefore the paths traversed, or the "chords," will not be the same. Speaking generally, the chords will be of unequal length, so that the time of transit at one station will be different from the time at the other. This difference will enable us to determine the difference in length of the chords described by the planet, and consequently their respective positions on the solar disc, and the amount of their separation. Now, this separation is what we want to know.

We already know the relative distances of Venus from the Earth and Sun; they are as 28 to 72 nearly; and whatever the absolute distances may be, the

value of the separation of the two chords, in miles, will be the same. It is evident, for instance, that if the Sun were exactly as far from Venus on one side as we are on the other, and the observers occupied the two poles of the Earth, the separation would be equal to the Earth's diameter; but as the Sun is farther from Venus than we are, in the proportion of 72 to 28, if the transit were observed from two stations, each chosen not too far from the Earth's poles, the separation of the two chords on the Sun would amount to 18,000 miles; and this proportion holds good whatever the distance.

If it were possible to photograph the Sun at the same moment at the two stations, the thing would be done; we could at once measure the amount of separation, determine its proportion to the whole diameter of the Sun, and determine the size of the Sun, whence its distance would at once follow, as we could at once determine how great an angle the Earth's semi-diameter would subtend at that same distance, which, in fact, would be the Sun's parallax.

Simultaneous observations, however, are out of the question; so the observations will take this form; the moments of ingress and egress are carefully noted at both stations, and the differences between the two chords will show us on what part of the Sun they lie; this known, it is easy to determine the separation.

As the difference between the observed times of transit at the two stations is the quantity which determines the amount of separation, it is important to make this difference as great as possible, as then any error bears a smaller proportion to the observed amount.

This is accomplished by carefully choosing the stations, bearing the Earth's rotations well in mind. Let us introduce this consideration, and see not only how it modifies the result, but also with what anxious foresight astronomers prepare for such phenomena, and why it was requisite in 1874, and will be again necessary this year to go far from home to observe them. We already know the instant and place (true, perhaps, to a second of time and arc) at which the planet will enter and leave the solar disc, in other words we know exactly how the Earth will be hanging in space as seen from the Sun—how much the south pole will be tipped up—how the axis will lie—how the Earth will be situated at the moments of ingress and egress.

Now if we suppose two planes cutting the centre of the Earth and those points of the Sun's limb at which the planet will enter and leave the solar disc, we shall see in a moment that some parts of the Earth will see the planet enter on the disc sooner than others. Some parts, on the other hand, will see it leave the disc later; in other words, according to the position of a place with reference to the place of which we have spoken, both ingress of the planet and its egress will appear earlier or later, as the case may be.

SOLAR UPHEAVAL AND MAGNETIC STORM.

EDGAR L. LARKIN, NEW WINDSOR OBSERVATORY.

The doubts that lingered in the minds of astronomers relating to the sympathy supposed to exist between solar and terrestrial phenomena wherein magnetic and electrical forces are concerned are in a fair way to be removed. The present year has been one of solar upheaval and terrestrial disturbance. On April 16th there was an electric storm and an Aurora on the earth, and an appalling cyclone on the Sun. The great abyss in the solar surface was watched at this observatory for a period of ten hours on that eventful day, and all remember the auroral display of the evening. And now there is a repetition of the same phenomena, with greater activity.

The daily press of November 17 was burdened with accounts of widespread magnetic disturbance, in some places suspending telegraphic manipulation.

The area of electric turbulence extended, so far as is reported, from New York to Yankton, and from Nashville to Winnepeg. And the Atlantic cable was a in state of unrest, so that doubtless the disturbing magnetic waves reached Europe. At Milwaukee carbons in an Edison vacuum lamp were rendered incandescent by electric currents flowing in from the atmosphere. At other points switchboards were set on fire and keys melted in telegraph offices, while in Nebraska electric balls were seen on the wires. Auroral displays of great intensity were observed at many places separated by wide distances, and by reports from the northern portion of the United States one cannot fail being impressed the with magnitude and duration of the electric undulations.

On Wednesday, November 15th, after an interval of cloudy weather, we secured a view of the Sun at noon. An enormous spot was at once seen already advanced on the eastern solar limb twenty-four degrees. It was evidently in a state of excessive turbulence, since none of the tongues of fire were straight, all were twisted, crossed, and contorted in every conceivable shape. The edges of the chasm were notched and indented in all possible forms. The "willow leaves"—jets of fire assuming leaf-like appearances—seemed to be sliding downward from the level surface of the sun along inclined planes leading to the black edges of the central nuclei, and in many cases projected over them, presenting a scene like fiery streams bending into a cavern of impenetrable darkness. The spot was broken by "bridges" of flame into three divisions, the central one being evidentaly in rotation about an axis—a radius of the Sun prolonged. This belief is sustained because all striæ, rifts, and granulations on the penumbra—the incline alluded to—were bent about in such direction and in such manner as would be caused by centrifugal force. Soon clouds obscured the Sun, terminating the observation before we had time to measure the length and breadth of the troubled region.

Seeing at once that the upheaval was on a somewhat larger scale than that in April last, we daily expected to hear of peculiar disturbance on the earth. We had not long to wait. The whole heavens were hung with a drapery of clouds until Sunday, November 19th, when the sky became clear, remaining so four hours, during which the spot was closely observed with high magnifying eye-pieces. The disruption was complete; the jet-black portions of the spot had broken into five huge masses, and another had developed at some distance, though partially submerged by fire.

At 8:30 A. M. two tongues of flame projected two-thirds the distance across the largest black division, apparently seeking to go across.

A 9:30 A. M. a jet started out from the opposite side, and extended toward the approaching end of the first. It was quite faint for half an hour, then increased in brilliancy, and extended further toward the first jet, which was also drawing nearer.

At 10:00 A. M. the ends of both flames became very bright and grew larger, with only a narrow line of black space between, when an approach and union seemed ready to take place at any moment. We watched with intense interest to see them unite, when clouds covered the whole celestial vault and remained all day, putting an end to astronomical observations. For fear of giving wrong impressions as to the rapidity of these movements, we will say that the tongues or jets of fire moved about as fast in the focus of the telescope as the hour-hand of a clock; we cannot see the motion, but after an interval of five minutes one can discern displacement.

But instances are on record in works on solar physics where the most rapid movements have been seen, such as explosions and sudden outbursts of flames. On October 7, 1880, Professor C. A. Young saw an outburst which hurled solar matter vertically to a height of 350,000 miles. At 10:30 A. M. the jet was 40,000 miles high; at 11:00 A. M. 80,000, and at noon the enormous altitude of more than 250,000 miles was attained, while at 12:30 P. M. the column of fire had subsided back again into the flames of the Sun. The velocity of ascent in this case was sixty-six miles per second, although in other cases a velocity of 200 miles per second has been observed.

Besides the five divisions in the great spot of November 15–19, 1882, we counted 108 in close proximity. Whenever we observe a large spot we are nearly always sure of finding many others around the edges. This great cluster then contained 113 distinct black spots, while on other portions of the Sun twenty-three more were to be seen. It is one of nature's mysteries why a solar upheaval should be followed by unrest upon the earth. Yet since the invention of magnetographs and spectroscopes proof seems conclusive. The magnetic or electric impulse requires but little time to traverse the mighty void between the Sun and Earth, as almost instantly after an outburst is observed on the Sun with a telespectroscope the instruments in magnetic observatories automatically record violent displacement.

On August 5, 1872, Professor Young beheld a powerful disruption on the

Sun that cast up matter with a rate of 120 miles per second. On writing to England he received reply that at the same time the British magnets were in agitation. Many theories have been advanced in explanation. One quite ingenious was announced by Barlow, who regarded the earth as a helix. He took a wooden globe and placed it on an axis inclined 23½° from a perpendicular, like the axis of the Earth. He passed insulated wires around it in positions in relation to latitude that isogonic and isoclinic lines are known to occupy on the real Earth. Above the globe at different places he suspended horizontal and dipping needles and then passed a strong electric current through the encircling wire. The needles behaved with remarkable similarity to those on the Earth, dipping and changing declination very much as do actual magnetic needles. He thought, therefore, that currents of electricity around the Earth induced terrestrial magnetism. But how magnetic unrest on the Sun affects this earthly current is still unknown. Some think the Earth a vast thermopile, which, when one side is heated by the Sun, produces changes in intensities of earth currents affecting the strength of the magnetic induction in such a way that the needles are enabled to detect it. But no known fact in thermo-electricity substantiates this idea. Again, the spectroscope, armed with a bolometer, reveals that sun-spots emit less heat than the solar surface, rendering the theory untenable. The bond of union between auroras and oscillations of the Earth's magnetism is also unexplained.

The whole series of experiments conducted during the last hundred years may be summed up into three facts: 1. The sun-spots have a periodic time of about eleven years. If we have, say, this year a maximum number of sun-spots, in eleven years another maximum will occur, requiring two years to reach the greatest number and two years to decline, the remaining seven years of the eleven presenting few periods of agitation on the Sun. 2. The number of auroras is the greatest during the year of sun-spot maximum. 3. At the time of the greatest turbulence on the Sun the most rapid changes in electric force takes place on Earth.

The sun-spot of November 17th, the aurora, and the magnetic storm were among the most remarkable known.

The present spot is so large that anybody can see it by simply viewing the Sun with a smoked glass.

The history of astronomy presents several such instances. In A. D. 807 a large solar spot was seen by the inhabitants of Europe; Kepler saw one in 1609; and that of April 16, 1882, could also be seen without other optical aid than a darkened glass.

We timed the transit of the spot on November 19th, the time across central wires being 13 seconds. With a solar parallax on 8.8″, the linear value of 1 second of arc at the Sun's distance from the Earth is 450.309 miles. Since 1 second of time of the Earth's rotary motion is equal to 15 seconds of arc, 13 seconds is equal to 195 seconds arc in space, which, multiplied by 450.309

gives 87.810 miles as the length of the spot; a length 20,000 miles greater than that of the spot of April 16th.

This measurement is that of the extreme length of the cluster including outlying spots and penumbra, and is not nearly as accurate as if made with a micrometer, but is correct, however, within 3,000 miles.

Study of solar phenomena is one of the most exciting lines of research, and it is to be hoped that with the powerful tele-spectroscopes, now capable of being made, together with sensitive instruments for the detection of magnetic pulsations, a hitherto unknown law of nature will soon be discovered able to solve the mystery.

NOVEMBER 20, 1882.

SOME RECENT IMPROVEMENTS IN THE MECHANIC ARTS.

BY F. B. BROCK, WASHINGTON, D. C.

ELECTRIC LAMP.—A recent English invention in electric lamps has four movable circular carbons which are combined with the usual carbon-holder, gear and regulating pinions, frame, armature, and magnet.

MINING SUBMERGED ROCK.—A late inventor has constructed a dredging vessel formed of a rod with two parallel rows of teeth projecting upward and outward therefrom and provided with closing end-pieces. It is dragged by a bail pivoted at the ends to the ends of the rod, and limited in motion by guide-slots at the top of the end-pieces. These rows of teeth, or prongs, are symmetrically arranged on opposite sides of the rod so that each set in turn operates to gather or retain the deposits as the dredge is drawn back and forth upon its one side, or the other, over the surface to be dredged.

COMBINED COAL-HOD AND SIEVE.—This novel coal-hod is provided with a removable bottom beneath which is located in horizontal ways a reciprocating sieve. When it is desired to sift the ashes gathered in the hod, the bottom is swung out of the way so that the ashes fall upon the sieve.

ELECTRIC INCANDESCENT LAMP.—One of Edison's latest inventions comprises a method of manufacturing incandescent electric lamps, consisting in forming the enclosing bulb or globe directly from the molten or pot-glass, forming separately the supporting tube or neck for the incandescent conductor, sealing therein the leading-in wires, attaching the carbon thereto and then hermetically uniting the parts by a welding together prior to the exhaustion of the lamp.

SAFETY-STOP FOR ELEVATORS.—This elevator has in combination with the suspension rope a counter-balance weight at its end and stop mechanism attached to the car. A safety-rope is employed having one end connected to the safety-

stop mechanism and its free end passes through the counter-balance weight of the suspension rope, whereby the safety-rope is adapted to sustain the counter-balance weight when the suspension rope breaks and thereby apply the stop mechanism to arrest the motion of the car.

STAINING GLASS-WINDOWS.—M. Oudinot, of Paris, has invented a process of coating stained glass with metal, which consists in first applying over the whole surface of the stained glass a coating of metallic powder, flux, and adhesive substance. The design is then perfected by removing more or less of the coating from some portions and increasing the coating on other portions, and in finally firing the glass thus coated. M. Oudinot has also devised a process of ornamenting glass for architectural purposes. This he does by first delineating the outlines of the design upon the glass, then coating such parts of the glass as are not included in the design with a mixture of gold powder and a liquid composition of ground glass or silex. The design is then covered with enamel of the desired colors and finally subjected to the fire.

EDITORIAL NOTES.

ON the 15th day of November earthquake shocks were felt all through the central western States; on the 16th a most remarkable sun-spot was visible, even to the naked eye protected by a smoked glass; on the 17th a most notable electric storm that pervaded the whole extent of the United States, and on the night of the 17th a very brilliant auroral display. About the same time a severe snow-storm swept over the eastern and New England States.

On the 19th of November the first snowfall of the season occurred here, lasting an hour or more and amounting to less than half an inch in depth. Last year our first snowfall occurred November 17th and amounted to three-quarters of an inch. So far, no ice has formed here over one inch in thickness.

IT will require $2,500 to satisfactorily complete the work of the American Archæological Institute at Assos, and the President, Prof. Eliot, of Boston, appeals to the friends of Science to come to its aid.

MR. FRANK BUSH, of Independence, Mo., proposes issuing, about the first of this month a neat little volume devoted to a description of the plants found in this county, under the title of "The Flora of Jackson County." Price 25c. It should be purchased by all persons interested.

PROF. D. S. JORDAN, of the Indiana University, is preparing for a summer tramp through Scotland, Norway, Germany, Italy, Switzerland, France and England, in June, July and August, 1883. This excursion is to be known as the "Indiana University Tramp," the party is limited to thirty persons and the expenses of each are not expected to exceed $350.00.

THE University of New Mexico, located at Santa Fe, calls upon liberal Christians all over the country to contribute to its endowment and building fund, as the only incorporated Protestant College in the Territory. It needs $20,000 for the first named purpose this year and $5,000 for the second.

THE proposed substitution of soft Bessemer steel for iron in the manufacture of nails, etc., at Wheeling and Pittsburgh will create quite a revolution in the iron manufacturing business, inasmuch as it will do away with puddling and puddlers and thus cheapen the cost as well as lessen the dependence on laborers. At a recent meeting of the Tariff Commission it was asserted that within five years low-grade Bessemer or open-hearth steel would take the place of iron for every purpose for which it is now used.

THE new permanent station for the Signal Service at Pike's Peak has at length been completed, as well as the construction of a telegraph line to connect the station at the summit of the mountain with the world below. The signal station is 14,000 feet above sea level, and 6,000 feet above Colorado Springs, and is constructed of granite laid in cement to resist the furious storms of that locality.

THE revelations of the "Zoöpraxiscope" in the hands of Mr. Muybridge regarding the positions assumed by animals in motion will give painters and sculptors several new ideas and if heeded will cause great modifications in their ordinary representations of horses, dogs and other common animals when running, trotting, etc.

PROFESSOR WILLIAM HARKNESS, of the United States Transit of Venus Commission, requests the publication of the following:

"There are many persons scattered over the country who have good telescopes, and who would be glad to observe contacts during the coming transit of Venus if they had any means of obtaining Washington time. The Western Union Telegraph Company has most generously agreed to give wide distribution to noontime signals from the Naval Observatory, December 4, 5. 6. and 7. As this service will be wholly gratuitous on the part of the telegraph company, the officers request all persons who intend to make accurate observations of the transit to immediately notify the nearest Western Union Telegraph office, as the transmission of signals will involve the use of many thousand miles of wire and the making up of many special circuits, all of which must be planned beforehand. Furnishing these signals free of cost to all observers is a contribution to science on the part of the Western Union Company which will be appreciated to every one interested in astronomy."

PROFESSOR SCUDDER is receiving no small amount of "chaff" from the daily papers, based upon an article read by him before the National Academy of Science, entitled "The Triassic Insects of the Rocky Mountains," which he explained to have been largely the ancestors of the common cockroach. Supplementary essays by the reporters are numerous and some of them quite amusing, it evidently being a familiar subject with them.

PROFESSOR A. V. LEONHARD, late instructor in assaying at Washington University, St. Louis, has opened an assay office and laboratory at 322 Chestnut Street in that city.

DR. PHENE, the noted English antiquarian and archæologist, has started from St. Louis on his return home. Dr. Phene has visited the principal aboriginal monuments yet remaining in this region and the chief collections of antiquities as far north as Lake Superior, and doubtless found much to add to his already vast stock of antiquarian knowledge.

THE Kansas City REVIEW OF SCIENCE AND INDUSTRY is one of the periodicals of which we delight to say a word in commendation. The REVIEW is chiefly a record of progress in science, although mechanic arts and literature are not foreign to its scope. The large work which it entails is to its editor, Mr. Theo. S. Case, chiefly a labor of love; but his zeal and public spirit ought not to be put to too severe a test. Every student and every person who wishes to keep informed on the topics with which it deals ought to be a regular reader of this magazine.—*Industrialist.*

DR. JOHN G. LEMMON has recently returned to San Francisco from Arizona, where he reports having found two or three species of potatoes growing wild in the mountain meadows or parks, probably as much as 6000 feet above the sea level.

ITEMS FROM PERIODICALS.

THE *New Medical Era and Sanitarian* is the title of a new medical monthly to be issued January 1, 1883, by Dr. A. L. Chapman of this city. It will be devoted to medicine and sanitary science, will contain fifty octavo pages and will be furnished to subscribers at the exceedingly low price of $1.50 per annum. Dr. Chapman's long experience and ability will enable him to provide his readers with much valuable information.

Knowledge says that "The comet which came to perihelion on September 17th last, seems to be a return of the comet of 1658 which is probably the same as the comet of 1843 and the comet of 1880. If so, there seems every reason to believe that in a few months will see the comet back yet again, and that the end will then not be far off,—the end of the comet we mean, not the end of the earth, as some seem to imagine."

Professor H. A. Howe, of Denver, Col., arrives at opposite conclusions and says that this comet is not the one of 1843, and that there is not danger that it will tumble into the Sun next year or at any other time.

THOS. PRAY, JR., editor of *Cotton, Wool and Iron*, formerly the Boston *Journal of Commerce*, of which we have had frequent occasion to speak highly as a first-class commercial and mechanical journal, expects to have his work, "Twenty Years with the Indicator," ready for delivery by January 1, 1883. Royal octavo, pp. 144, $1.50.

WE find in the Missouri *Republican* of November 19th, a report of a very interesting lecture by F. F. Hilder before the Century Club, upon the "Rise, Growth and Decay of Ancient Art."

THE *Atlantic Monthly* for 1883 will contain, in addition to its variety of Serial and Short Stories, Essays, Sketches, Poetry, and Criticism, the following specially attractive features: Oliver Wendell Holmes will write frequently and exclusively for it; Henry Wadsworth Longfellow left a completed dramatic poem entitled "Michael Angelo," which he was more than ten years in writing. The first installment of the poem, which is in three parts, will appear in the January number; Nathaniel Hawthorn left among his manuscripts the plan and sketches of a novel, which will appear in *The Atlantic* under the title, "The Ancestral Footstep: Outlines of an English Romance." The first portion appears in the December number, with an introduction by Mr. George P. Lathrop. It will be continued in the earlier numbers of 1883; Mr. James will also write a new story and some critical and literary papers, such as the readers of the magazine have heretofore found so admirable; Mr. W. D. Howells, author of "Their Wedding Journey," etc., whose stories and essays have so often delighted the readers of *The Atlantic*, will from time to time send to the magazine from Europe sketches of travel, character, and literature; Mr. Charles Dudley Warner, author of "My Winter on the Nile," "My Summer in a Garden," "Backlog Studies," etc., promises several papers for the coming year.

FOWLER & WELLS are about to publish "A New Theory of Species," by Benj. G. Ferris; "Traits of Representative Men," by Geo. W. Bungay, and "Forty Years in Phrenology," by Nelson Sizer.

THE Boston *Literary World*, in speaking of the REVIEW, says, "It makes an appeal for a more generous support, which it fully deserves. In a modest way it is doing a good work."

THE *Iowa State Register* of November 16th, contains the Proceedings of the DesMoines Academy of Science, including an excellent inaugural address by President A. R. Fulton.

Harper's Monthly is unusually rich, as its December contents show: Decorating the Church for Christmas, drawn by F. Dielman, (Frontispiece); The Columbia River, Cleveland Rockwell, (with 13 illustrations); William Black at Home, Joseph Hatton, (with 6 illustrations); Found Drowned—A Poem, Dinah Mulock Craik, (with 1 illustration by Abbey); The Great Sea-Port of Western France, Thomas W. Knox, (with 12 illustrations); The Bride-Cake—A Poem, Robert Herrick, (illustration by E. A. Abbey); Southern California, III, William Henry Bishop, (with 18 illustrations); Some Day—A Poem, Isabella Grant Meredith; His Poetrie his Pillar—A Poem, Robert Herrick, (illustration by E. A. Abbey); Cameos of Colonial Carolina, P. D. Hay, (with 9 illustrations); The Singular Vote of Aut Tilbox, (with 3 illustrations by A. B. Frost); Storing Electricity, Henry Morton, (with 7 illustrations); For the Major—A Novel, Constance Fenimore Woolson, (with 1 illustration); Among the Rose-Roots—A Story, A Working-Girl; New England in the Colonial Period, John Fiske; The Two Fleets—A Poem, Eugene Bolles; Tom's Moniment—A Story, Susan Hartley Swett; Shandon Bells—A Novel, William Black, (with an illustration by William Small); Editor's Easy Chair; Editor's Literary Record; Editor's Historical Renord; Editor's Drawer.

THE *Popular Science Monthly* presents the following table of contents for December: Mr. Goldwin Smith on "The Data of Ethics," by W. D. Le Sueur, B. A.; Time-Keeping in London, 1—by E. A. Engler, (illustrated); The Relations of the Natural Sciences, by T. Sterry Hunt, F. R. S.; Brain-Weight and Brain-Power, by J. P. H. Boileau, M. D.; The Cell-State, by Professor Ferdinand Cohn; American and Foreign Asphalts, by E. J. Hallock, Ph. D.; Speculative Zoölogy, 1—by Professor W. K. Brooks; Annual Growth of Trees, by A. L. Child, M. D.; Science in Relation to the Arts, 11—by C. W. Siemens, F. R. S.; Musical Sensations, by M. Héricourt; Is Fingal's Cave Artificial? by F. Cope Whitehouse, M. A., etc., (illustrated); The Spectroscope and the Weather, by C. Piazzi Smith; Criminality in Animals, by A. Lacassagne; Sketch of Matthias Jacob Schleiden, (with portrait); Entertaining Varieties; Editor's Table: Spencer's Impressions of America—Principle in Small Things; Literary Notices; Popular Miscellany; Notes.

IN connection with the first volume of the "Surgeon's Stories"—Times of Gustaf Adolf—which Jansen, McClurg & Co. will issue in a few days, the following from a late number of the *New York Nation* will interest our readers:

"A noticeable literary phenomenon is the sudden and widespread revival of the 'Surgeon's Stories,' by Prof. Z. Topelius, a translation of which is in the press in this country, and will probably also be brought out in England. A new translation of them is being also made in Germany, and a new edition has just appeared in Denmark, published by P. G. Philipsen, Copenhagen; the translator being Fr. Winkel-Horn. Finally, the Swedish publisher of Topelius's works, Albert Bonnier, has in preparation a superb illustrated edition, the designs for which are by Larsson (the same artist who illustrated Bishop Wallin's fine poem, 'The Angel of Death,') and will number 350, or between fifty and sixty for each volume. Few works offer such abundant material to the artist. Topelius's tales cannot fail to have a great success in all Protestant countries, and Mr. Bonnier intends issuing an edition of 15,000 copies of the new illustrated series, at the same price as that of the original edition without illustration."

THE New York *Observer*, pioneer of the religious press, enters upon its sixty-first volume with the new year. Undenominational, unsectarian, evangelical and national, it is just the right kind of a newspaper for family reading and is a favorite wherever it is taken. $3 15 per annum.

PROF. GEO. C. SWALLOW, for many years connected with the University of Missouri, and formerly State Geologist, has removed to Montana Territory and is now editing the Helena *Independent*.

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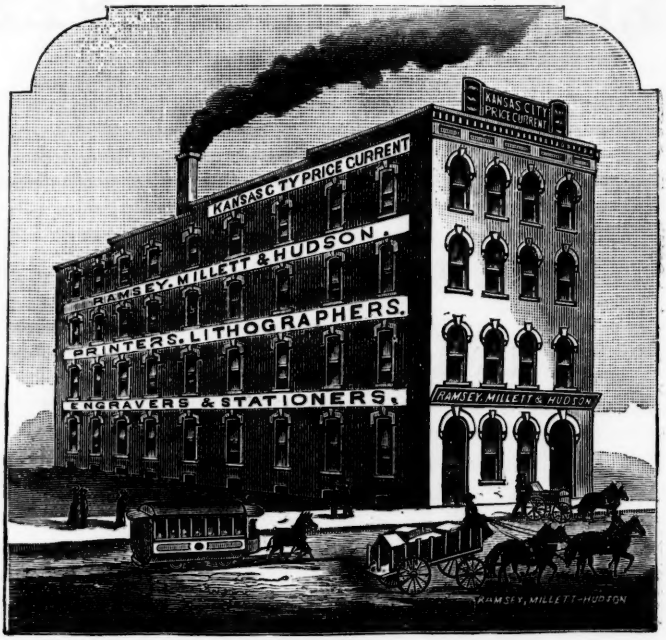

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